LY, 1949

RAILWAY MECHANICAL ENGINEER

JULY, 1949

RAILWAY MECHANICAL ENGINEER

With which is incorporated the Railway Electrical Engineer. Founded in 1832 as the American Rail-Road Journal.

VOLUME 123 **NO. 7**

Published monthly by Simmons-Boardman Publishing Corporation 1309 Noble street, Philadelphia, Pa. Editorial and executive offices: 30 Church street, New York 7, and 79 W Monroe street, Chicago 3. Branch offices: Terminal Tower, Cleveland 13; 1081 National Press bldg., Washington 4, D. C.; 1038 Henry bldg., Seattle 1, Wash.; 300 Montgomery street, Room 805-806, San Francisco 4, Calif.; 530 W. Sixth street, Los Angeles 14, Calif.; 2909 Maple avenue, Dallas 4, Tex.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A.B.P.) and the Audit Bureau of Circulations (A.B.C.) and is indexed by the Industrial Arts Index and also by the Engineering Index Service. Printed in U. S. A.

Subscriptions payable in advance and postage free, United States, U. S. Possessions and Canada, 1 year, $3; 2 years, $5. Other countries in Western Hemisphere: 1 year, $5; 2 years, $8. All other countries; 1 year, $7; 2 years, $12. Single copies 50 cents. Address H. E. McCandless, circulation manager, 30 Church street, New York 7.

PRINTED BY PERIODICAL PRESS CORP., PHILA. 23, PA.

RAILWAY
MECHANICAL
ENGINEER

The Alco-G.E. Gas Turbine-Electric Locomotive

By *P. T. Egbert*† and *G. W. Wilson*††

Preliminary testing over, 4,500-hp. unit now goes to the Union Pacific for actual service on the road

THE public announcement of the Alco-G.E. gas-turbine-electric locomotive could be an occasion for big headlines, broad claims, and considerable speculation; however, we believe that the railroads and the manufacturers will best be served by presenting it in a more conservative manner.

What possible good could result to any of the interested parties from beating the tom-toms about this untried locomotive prime mover which, at best, will take years to develop, test and prove? What is to be gained by creating a diversion at this time, when the railroads are just beginning to reap the benefits of a still relatively new Diesel-electric locomotive?

† Vice-president, American Locomotive Co.
†† Manager, Locomotive and Car Equipment Division, General Electric Co.

The American Locomotive Company and General Electric believe that they can best serve the interests of all parties in our growing, competitive, free-enterprise America by continuing to devote major attention to the design and production of motive-power units we are sure will help move more ton-miles at less cost.

Purchases indicate that the railroads are now thoroughly convinced of the operating economies that can be effected by the Diesel-electric locomotive. A revolution in motive power is taking place before our eyes. In 1948, for the first time in history, the number of passenger train car-miles propelled by Diesel-electric locomotives exceeded that of coal-burning locomotives. It seems certain that in years to come Diesel-electrics will haul the major portion of railroad passengers and tonnage.

GENERAL CHARACTERISTICS OF THE 4,500 HP. ALCO-G.E. GAS-TURBINE-ELECTRIC LOCOMOTIVE

Locomotive	
Horsepower rating	4,500
Continuous tractive force (at 20.5 m.p.h.) lb.	68,500
Tractive force (at 25 per cent adhesion) lb.	125,000
Maximum speed, m.p.h.	79
Height, ft.—in.	15—4-5/16
Weight on drivers, lb.	500,000
Width over hand rails, ft.—in.	10—7
Length inside knuckles, ft.—in.	83—7½
Horsepower per ft. of length	53
Fuel capacity at 4,500 hp., gal.	6,600
Axles (all driving)	Eight
Gear ratio	65/18
Truck wheel base, ft.—in.	9—4
Total wheel base, ft.—in.	68—3
Maximum track curvature, deg.	21
Wheel diameter,, in.	42
Supplies:	
Fuel oil, gal.:	
Bunker C	6,670
Diesel fuel	345
Lubricating oil, gal.	300
Water, gal.:	
Cooling	145
Boiler	574
Sand, cu. ft.	45
Power Plant	
Horsepower rating	4,800
Shaft output rating, kw.	3,500
Weight, lb.	25,000
Overall length, ft.	19
Overall width, ft.—in.	6—8
Turbine inlet temperature, deg. F.	1,400
Ratio of weight to horsepower, lb. per hp.	Five
Compressor pressure, atmosphere gage	Five
Overall thermal efficiency, per cent	Over 17
R.p.m. at rated shaft hp.	6,700
Designed altitude for rating, ft.	1,500
Ambient air temperature for rating, deg. F.	80
Fuel	Bunker C
Starting fuel	Diesel fuel
Air intake rate, cu. ft. per min.	80,000

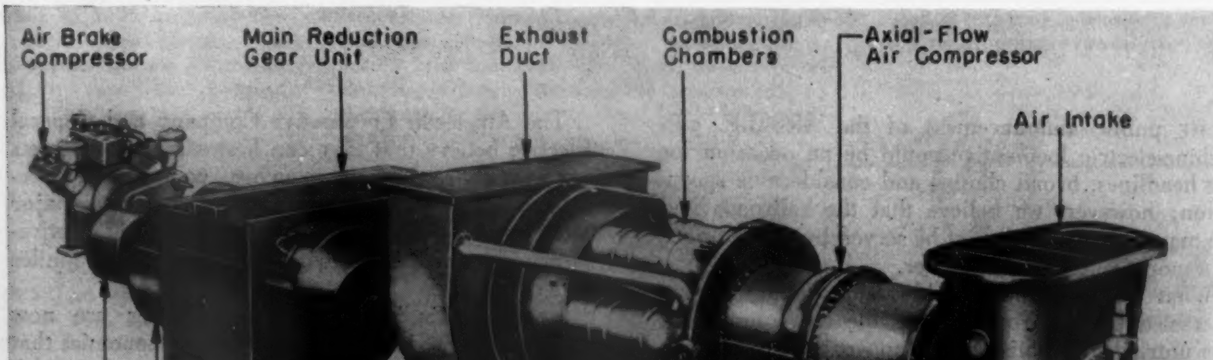
Progress has always been based on change. Natural resources become exhausted. Requirements are different. Scientists discover new and better alloys. Consequently, any company that intends to stay in business must continually investigate all new possibilities; otherwise they may find themselves out of the picture in a short time. It is quite natural, therefore, for the American Locomotive Company and General Electric to investigate the application of the gas-turbine prime mover to the railroad locomotive.

Any industry has broad indices of growth and improvement. Naturally, no index tells the whole story but, over the years, it gives a good general picture of progress. The common index for automotive and airplane engines is increased horsepower per pound of material.

Consider the history of motive power development in the railroad industry. The maximum height and width of locomotives has been set for years by clearance requirements so, broadly speaking, the only general dimensional variable is overall length. A general index of locomotive progress in terms of better utilization of space and material is found in horsepower per foot of length. Such an index cannot take into account all pertinent factors. For example: fuel economy, maintenance and per cent of weight on drivers are important considerations in railroading. Horsepower per foot of length has increased steadily.

The gas-turbine story centers around the curve for internally-powered electric locomotives which, up to the present time, has been traced by the Diesel-electric, current designs of which deliver about 30 hp. per ft. of length. There is a practical limit to which this index can be carried; however, there is nothing to indicate that designers have reached this limit for internally-powered locomotives.

When a new and relatively small prime mover in the form of the gas turbine became available, Alco and G.E. felt that it merited thorough exploration. Current models of gas turbines for aircraft use develop one horsepower per pound of material, whereas the Diesel engine used in today's locomotives develops only one horsepower for every 16 to 18 lb. of material. On the surface, this looks promising to the locomotive designer. However, this big difference is not all designer's delight, because the application of the gas turbine to locomotives raises problems and involves factors peculiar to the railroad industry. The first and foremost of these is the matter of life. Engines for military aircraft have a life expectancy of only a few hundred hours. The railroad industry



Power plant for gas turbine-electric locomotive

thinks in terms of thousands of hours between overhauls. Furthermore, certain auxiliaries are necessary for locomotive application. Consequently, the gas turbine evolved for railroad service rates one horsepower for six pounds of material. Even at this figure, the material is used about twice as efficiently as in a comparable Diesel engine. In terms of locomotive length, this means about 53 hp. per ft. of length as compared with 30 hp. for a Diesel-electric locomotive.

Certain railroad requirements as to design and performance must be kept in mind when designing any type of locomotive: (1) The height and width are strictly limited by the necessity of clearing bridges, tunnels, stations, etc. along the right of way; (2) Operating limitations, especially on curves, dictate a total length of 100 ft. or less per unit; (3) Track structure limits the desirable maximum load per axle to approximately 60,000 lb.; (4) Under present operating conditions, the maximum horsepower per axle is about 500; (5) All the weight of the locomotive should be carried on drivers if possible; (6) The design should preferably be such as to permit operation from either end of the locomotive without turning; (7) The design should give good riding qualities for reasons both of comfort and ease on the track; (8) The running gear should be as simple and sturdy as possible. (This dictates the use of swivel trucks whenever practical.); (9) It is desirable that provision should be made to carry a fuel supply adequate for a minimum of twelve-hours operation at full-locomotive output; and (10) The design should have modern lines and present a pleasing appearance.

In addition to these general considerations, inherent characteristics of the gas-turbine power plant set their own requirements: (1) The power plant is a single unit; (2) Arrangement must be made for speed reduction by gearing between the power plant and the traction generators. In one sense, this is an advantage, for it allows the optimum generator speed to be selected; (3) The fuel system must provide large storage capacity because the turbine fuel rate is relatively higher than that of a Diesel engine. The system must also be designed to handle low-grade residual fuel; (4) A starting system must be provided for the power plant. This is more complicated and difficult than in the case of a Diesel-electric locomotive; (5) Provision must be made to handle a large amount of filtered air for combustion. In the case of the present power plant, this amounts to about 70,000 cu. ft. per min. A Diesel-electric of comparable horsepower requires only 15,000 cu. ft. per min. for combustion. Air needed for engine-cooling radiators brings the total air taken aboard the Diesel-electric to about 200,000 cu. ft. per min., but only the combustion air has to be filtered.

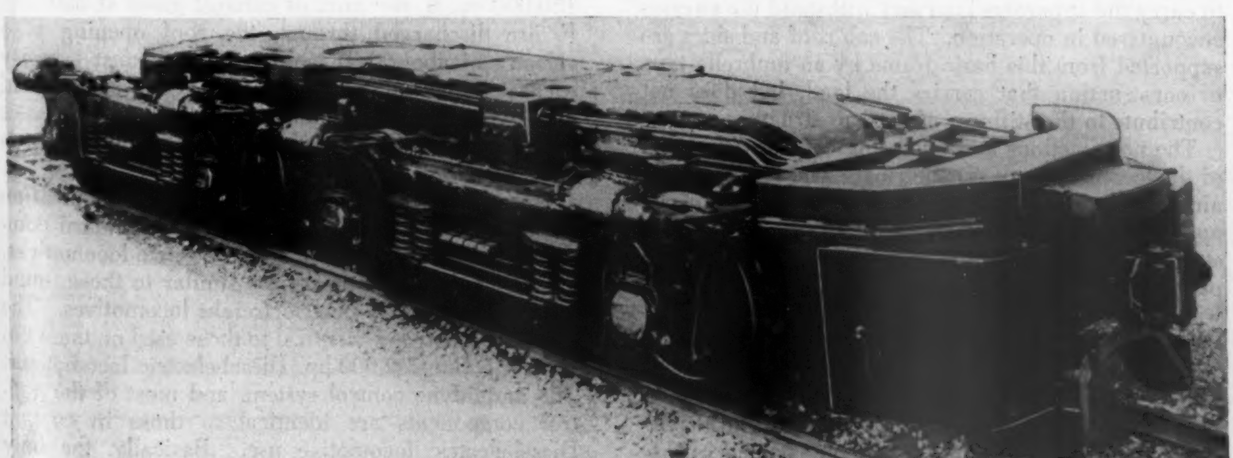
There are two facts which are of distinct help to the locomotive designer: The power plant weighs less than half as much per horsepower as a locomotive-type Diesel engine, and in the case of the gas turbine, only the lubricating oil requires cooling. This is about one tenth of the amount of cooling per horsepower that is required by a Diesel engine.

Description of the Gas-Turbine Electric Locomotive

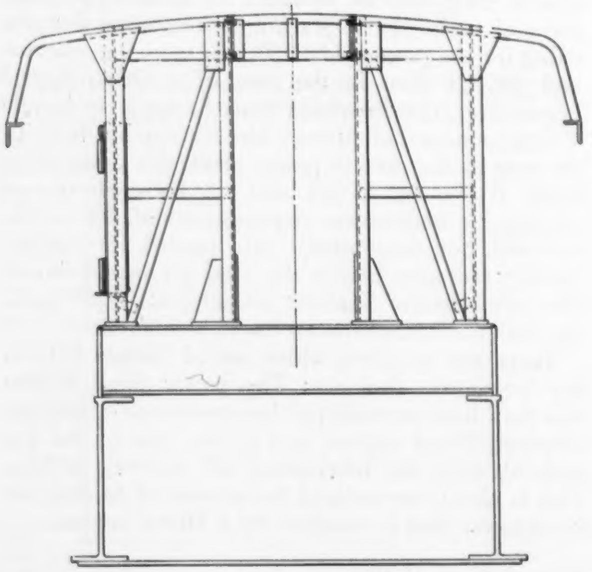
Consider the locomotive as it exists today. It is 83 ft. 7½ in. long over coupler knuckles and 78 ft. over cab ends. It is 14 ft. 3½ in. high over the roof sheet, and 10 ft. 7 in. wide over the handrails. The running gear consists of four 2-axle, swing-bolster, swivel trucks with all axles motored. The locomotive is built for double-end operation and fitted with twin sealed-beam headlights. The cab is carried on two span bolsters, each of which rests on two trucks. The draft gear and pilots are attached to the outer ends of the span bolsters.

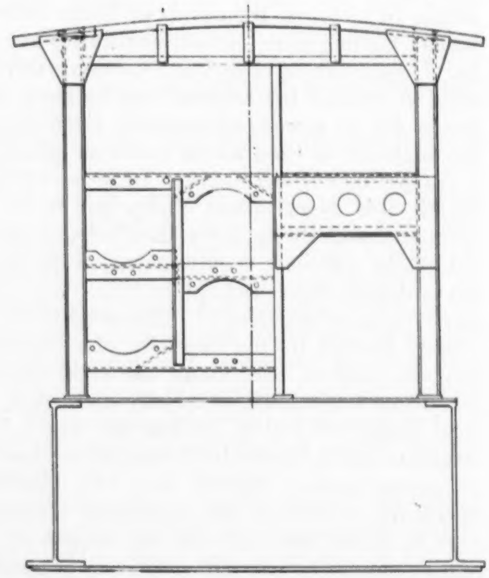
Under normal conditions of temperature and altitude, the locomotive has 4,500-hp. input to the generators for traction purposes. The power plant under the same conditions develops 4,800 hp. The difference of 300 hp. is used to drive auxiliaries.

Most of the area of the locomotive cab sides, except where there are sand boxes, is made up of air filters. This insures an ample supply of filtered air for combustion in the power plant and for equipment use.



Half of the running gear showing the span bolster





Typical cross-sections through underframe, fuel tanks and superstructure

The cab underframe which supports both the apparatus and the cab structure has been designed to act as a fuel tank. It consists of two tanks—one 31 ft. long, and the other 21 ft. long—separated by a dry-well section in the center. Beyond the shorter tank are two smaller tanks—one for Diesel fuel and the other for boiler water. This entire frame structure is about 33 in. high and 7 ft. wide. It is essentially a box member interlaced with baffles which serve the double purpose of stiffening the section and preventing the fuel from sloshing. Stainless steel heating coils are fabricated into the bottom portion of the tank for warming the heavy residual fuel. The tanks have a combined capacity of about 6,600 gal.—sufficient fuel for about 12-hours operation at 4,500 hp.

The cab structure differs from the conventional truss type widely used on Diesel-electric locomotives. The under-frame fuel-tank structure is stiff enough to carry the apparatus load and withstand the stresses encountered in operation. The cab roof and sides are supported from this basic frame by an umbrella type of construction that carries the load, but does not contribute to the stiffness of the cab structure.

The nose sections and operating cabs at either end of the locomotive are symmetrical. The former house air-brake equipment, train control and miscellaneous apparatus. The latter contain the usual operating stations—controllers, air-brake stands, instrument panels, and controls for cab heaters, defrosters, window wipers, sanders, whistle and bell. There are three seats for crew members in each operating cab. These cabs are acoustically treated and insulated. They are separated from the equipment compartment by insulated bulkheads and doors. The central portion of the cab is the equipment compartment. This houses the electric control in two groups adjacent to the end bulkheads. Next to the control groups are the traction-motor blowers. The central portion is occupied by the power plant, together with fuel and lubricating oil filters, and the main gear unit which drives the four traction generators and supports the two resistor groups used for dynamic braking. Next comes the gear-driven air compressor, the lubricating oil cooler and radiator section, the steam generator, the sump pumps and the Diesel-engine generator set for starting the turbine.

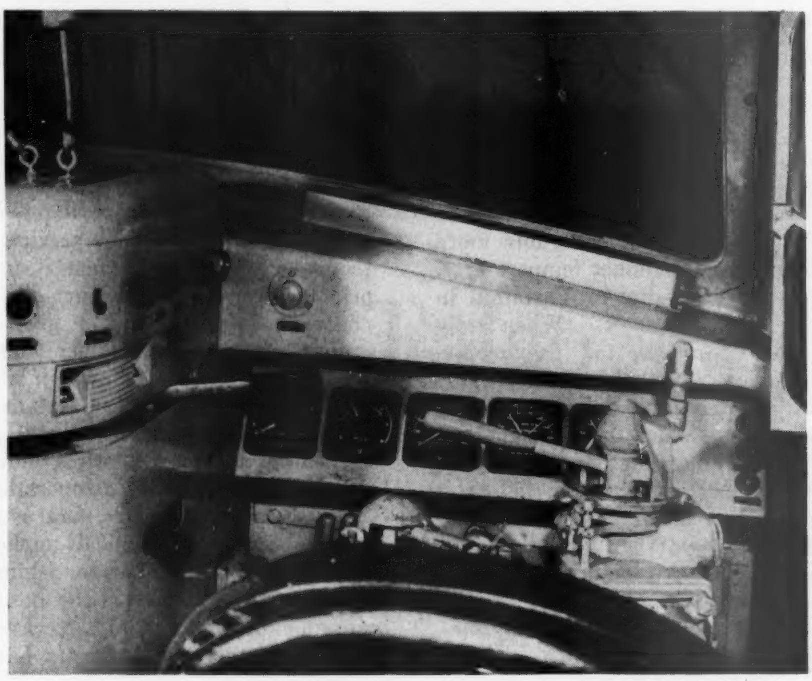
The power plant consists of a 15-stage, axial-flow compressor, taking its air through an acoustically-treated inlet housing, driven by a two-stage gas turbine. Compressed air is admitted to six combustion chambers where the fuel oil is introduced under pressure and burned. The hot gases pass directly into the two-stage turbine, and then are discharged through the roof. Roughly speaking, the turbine generates three times the net output power. The compressor load absorbs two-thirds of the total, and one-third appears at the output shaft as useful work. About 150,000 cu. ft. per min. of exhaust gases at 850 deg. F. are discharged through the roof opening at a velocity of about 150 m.p.h. This exhaust is noisy even at idling (about 60 per cent of full speed) but, due to its unpitched quality, the sound attenuates rapidly and is not objectionable except when one is standing close to the locomotive.

One characteristic that deserves particular mention is the inclusion, as far as possible, of standard components currently used on Diesel-electric locomotives. The two-axle swivel trucks are similar to those found on 1,500-hp. Diesel-electric freight locomotives. The traction motors are identical to those used on the Alco-G. E. 1,500 and 2,000-hp. Diesel-electric locomotives. The amplidyne control system, and most of the control components are identical to those in current Diesel-electric locomotive use. Basically, the only untried portion of the locomotives is the power plant and fuel-handling system. The testing program can, therefore, be laid out to concentrate on these items,

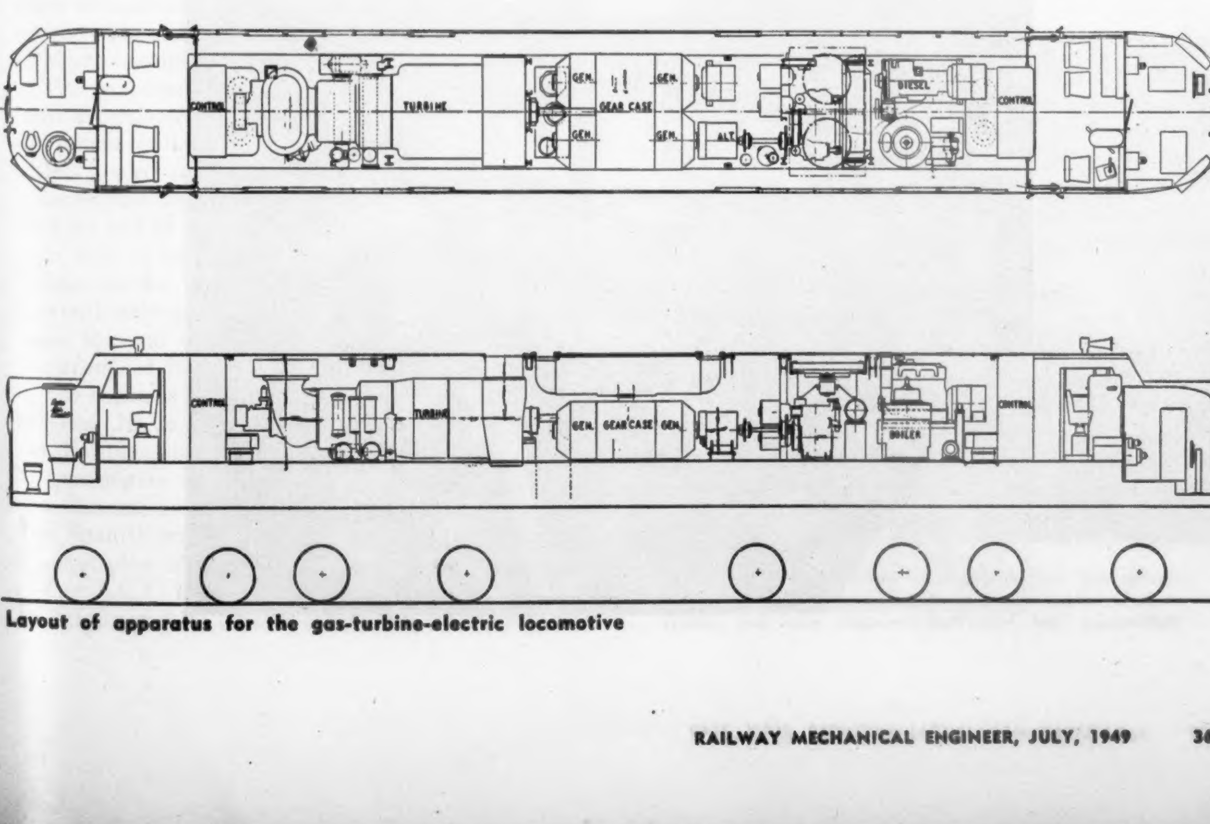
with little concern as to the satisfactory performance of the rest of the locomotive.

The designers are quite excited about the possibility of developing a new type of locomotive. It can be appreciated, however, that there are several basic factors as yet unevaluated, which cannot be figured on a slide rule or determined in the laboratory. The answers can only be found by actual operating experience on a railroad. The possibilities of this locomotive in actual operation are still a big question mark. Several aspects must be investigated more thoroughly before it can be said with certainty that the present design even belongs on the same curve with the tested and proved types of motive power.

The first item of prime importance is life expectancy. The bogey of the engineers when designing the gas-turbine locomotive power plant was 15,000 hours between major overhauls. This is about three times the interval for a Diesel engine and it should mean great economies in maintenance costs. The



The operator's position in the cab



Layout of apparatus for the gas-turbine-electric locomotive

history of a rotary power plant versus a reciprocating engine bears out this promise. However, only continued service over several years will give the determining data.

The second big unknown is fuel. The present power plant is inherently much less efficient than the Diesel engine. Improvement in design and the use of better alloys, however, can and will increase this basic efficiency. Moreover, the gas turbine offers considerable promise of some day burning low-grade fuels, especially coal. The only part of the question that now appears vexing is that the gas-turbine power plant is a poor idler. It consumes one-third as much fuel at no load as at full load. As is well known, railroading is anything but a full-time, full-load operation. Again, only years of actual operation will reveal the fuel economics of the gas-turbine-electric locomotive, and the type of service for which it is best suited.

In addition, there are several operating characteristics of this new locomotive that can be evaluated only in revenue service. For example, the gas turbine is more efficient and can deliver considerably more power in cold weather than at summer temperatures. What does this mean in railroading? Variation in locomotive weight is another factor. When fully fueled and ready for operation, the gas-turbine-electric locomotive carries 50,000 lb. of fuel. This means more weight on driving axles and greater ability to start heavy trains. When the fuel supply is low, the loss of weight gives the locomotive the equivalent of seven motored axles where before it had eight. What does this mean in terms of ton-miles hauled?

The locomotive looks like a conventional electric locomotive. It has the same type of cab and running gear. The new part is the gas-turbine power plant which has been designed for electric drive, and put into existing space and weight limitations. It is believed to offer great possibilities for the future, but no one can evaluate its true worth today. For example, the Diesel-electrics now going into service reflect 30 years of development guided by operating experience.

Even though this first Alco-G.E. gas-turbine-electric locomotive has lived up to expectations on initial tests, it may certainly be said that the models to follow will be considerably different and will be evolved slowly and cautiously.

The Union Pacific has agreed to operate this locomotive in service beginning this summer. The experience gained there will give further information as to its durability, suitability and operating costs.

This locomotive may or may not be a milestone in the century-long evolution of better railroad motive power. At best, the five years of research already spent on this first unit, can represent no more than the beginning of the development of a locomotive type suitable for revenue service. The primary objective of this development is to find a locomotive prime mover that will: Burn low-grade fuels—especially coal—economically; give higher horsepower output per pound and per cubic foot, and have greater reliability and lower maintenance cost.

How well Alco-G.E. is meeting these objectives and how the gas-turbine power plant will compare with other locomotive prime movers, is still an unknown that only miles of operation in railroad service can determine. One fact is assured: Alco-G.E. will explore the practical application of the gas-turbine locomotive before asking the railroads to place their faith in it.

A. C. F. Talgo Train

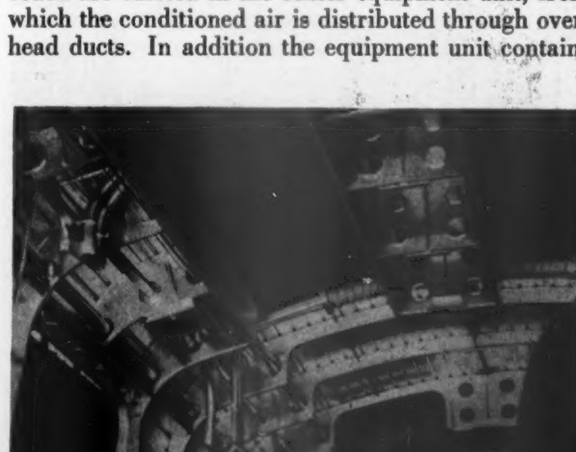
The American Car & Foundry Company demonstrated the first of three A.C.F.-Talgo trains on April 20 of this year on a press run over the tracks of the Delaware, Lackawanna & Western between Hoboken, N. J., and Dover and since then seven demonstration trips have been made over this territory on which the train has been shown to over four hundred railroad officers and other guests. This train, based on the Spanish "Patentes Talgo," consists of an A.C.F.-built locomotive, one baggage unit and one coach of five units articulated. The other two trains, when completed will be placed in service in Spain between Madrid and the French border, a distance of approximately 500 miles.

The car design is unique. The coach consists of four articulated passenger-carrying units and one equipment unit, each unit having only one pair of wheels placed at the rear. The front end of each unit is supported by a special coupling arrangement on the back end of the unit ahead. The independent baggage unit is carried at the front by a trapezoidal linkage at the rear of the locomotive, which is on conventional-type trucks. Entrance to the coach is made through the equipment unit placed midway in the group of four-passenger-carrying units.

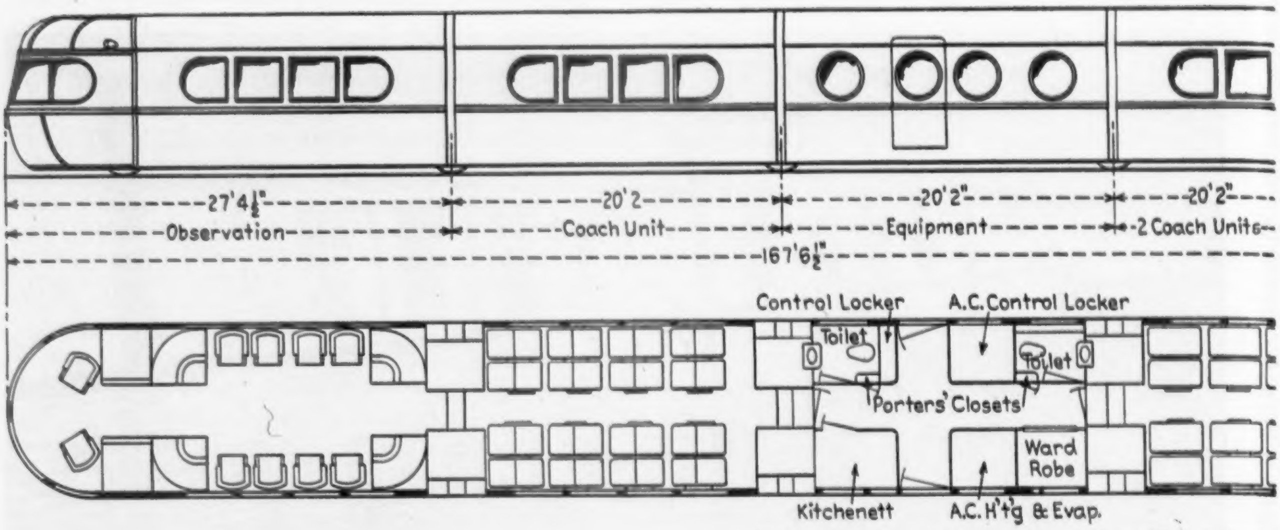
The coach is about 101 feet long and seats 64 passengers, 16 in each passenger unit. However, the A.C.F.-Talgo includes the observation lounge seating 16 passengers instead of the fourth passenger unit and this section adds seven feet to the coach length. The Spanish trains will seat 176 passengers in three coaches plus 16 seats in the observation lounge.

The A.C.F.-Talgo coach has a squat appearance. Its height of 9 ft. 7 in. is about four feet less than a standard coach and its floor level is 2 ft. 9 in. lower. The overall width is 10 ft. 7½ in.; the inside width is 10 ft. 1⅛ in. With each passenger unit weighing 6,700 lb. and the equipment unit 10,600 lb., the five-unit coach weighs 37,400 lb. This is increased by 1,500 lb. when the observation lounge replaces one of the passenger units. The baggage unit weighs 6,300.

The heating and air-conditioning plants for each coach are carried in the center equipment unit, from which the conditioned air is distributed through overhead ducts. In addition the equipment unit contains



Framing details of the aluminum-alloy car structure. The units were made in three parts: underframe and two side-and-half-roof sub assemblies



Side elevation and floor plan of the A.C.F.-built loco

a kitchenette, a wardrobe, control lockers and the toilet facilities for the coach. Electric power for the entire train is supplied by engine-generator sets in the locomotive. Water is supplied under pressure to the equipment cars from 300-gal. tanks on the locomotive through copper tubing and flexible connections between the units.

Aircraft-type aluminum alloys are used for all body

Interiors of a coach unit and the observation unit. The aisle contour shows how the articulated train follows the track curvature

framing. The U-shaped center sill is an extruded section 5½ in. deep. Cross bearers, floor beams and floor stringers are Z-sections. Two parallel extrusions, one assembled with the underframe, the other with the side assembly, form the side sill. A false door of Alclad is riveted to the bottom of the underframe.

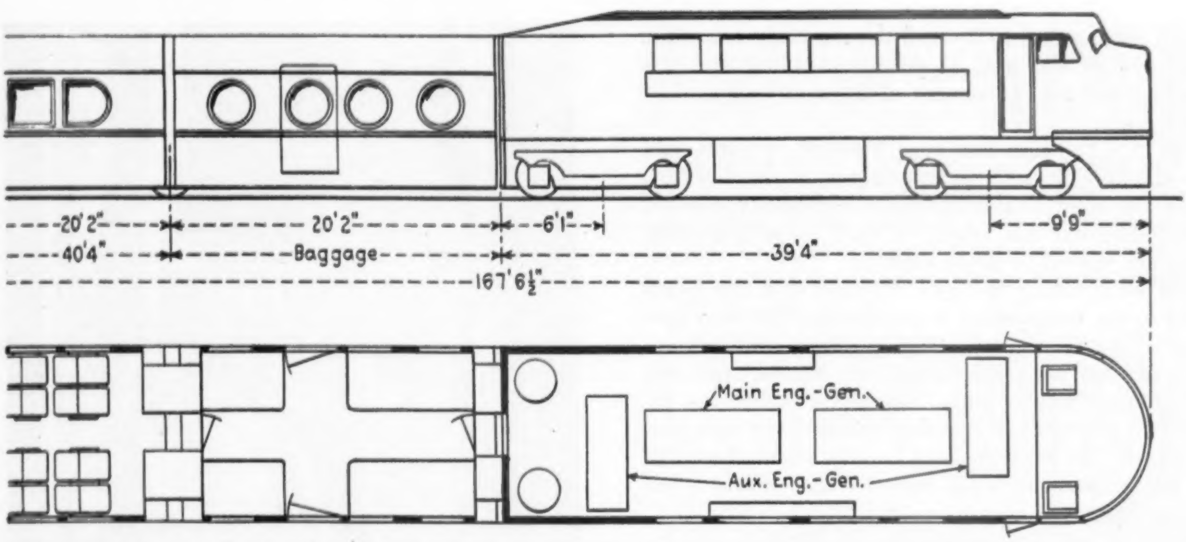
Combination one-piece side posts and carlines from the cross-section contour from the side sill to the center of the roof. Channel-section side plates hold the side posts in position. For tying in the skin metal between the joints belt and drip extrusions are used.

The roof and the sides from the bottom of the window sill down are beaded aluminum-alloy sheets. Flat sheets are used between the belt and drip extrusions. The two purlines are extruded J-sections.

Where partitions are required, the car ends are of metal bonded to plywood, otherwise they are open to form a continuous coach. For weather protection and to form a smooth interior and exterior, rubber diaphragms are applied between the units. These are closed by special zippers with sealing lips.

The Talgo units have no draft gear. The coupler is a simple jaw-and-pin arrangement which normally only transmits the pulling forces. In an emergency the coupler will pivot on its connections and carry the entire load of the front end of the unit. The vertical load normally is carried by two load bearers, 32 in. above the rail, consisting of a socket member on each side at the front and a matching horizontal pin member at each side of the rear of each unit. These supporting members are approximately at the level of the center of gravity. The load bearers, together with the two wheels, make a four-point suspension for each unit. These load bearers will also take a pulling load in an emergency through a circular slot and key arrangement on the pin members. Two steel safety cables will also pull and support each unit if the other coupling should fail.

The two wheels are similar in design to those used on P.C.C. street cars. They have built-up wheel centers of welded construction with a steel tire resiliently connected to the core by a rubber sandwich which re-



motive and six two-wheel articulated car units

duces running noises. Brake drums are fastened directly to the wheels and are designed for automotive-type internally expanding brakes. The brakes are hydraulically operated from a power cluster and relay valve in each equipment unit which in turn is operated by the engineman's air brake valve. The maximum brake-cylinder pressure is 100 lb. per sq. in. which results in a 250 lb. per sq. in. pressure in the hydraulic system.

The wheels are equipped with roller bearings and mounted on stub axles which are spaced by means of fittings and a non-rotating U-shaped tubular axle to maintain track gage. Connecting the end of the stub axle with the car body is a vertical helical spring and integral hydraulic snubber, with universal joints and resilient bushings at the ends. There is one horizontal stabilizer per unit, consisting of a double-acting torque bar attached from the fixed axle to the center sill through rubber bushing joints and a shock absorber. These elements, together with sway bars and radius rods, provide vertical and horizontal elasticity without permitting the unit to roll. The radius rods maintain the stub axles in alinement and resist braking torque.

At the front end of each unit an auxiliary jacking assembly is located directly over each rail. Each assembly consists of retractable flanged dolly wheels actuated by a crank and worm gear. When these

PARTIAL LIST OF MATERIALS AND EQUIPMENT ON A.C.F.-TALGO

Aluminum sheets, plates, bars, extrusions, forgings and castings	Aluminum Company of America, Pittsburgh, Pa.
Aluminum pressings	Edo Aircraft Corp., New York
Steel castings	Lebanon Steel Foundry, Lebanon, Pa.
Truck material	General Steel Castings Corp., Granite City, Ill.
Metal covered plywood	Haskelite Manufacturing Corp., Grand Rapids, Mich.
Panels	Harrington & King Perforating Co., Chicago
Diaphragms	B. F. Goodrich Co., Akron, Ohio
Wheels and axles	Bethlehem Steel Co., Bethlehem, Pa.
Roller bearings	Timken Roller Bearing Co., Canton, Ohio
Springs	Railway Steel Spring Division, American Locomotive Company, New York
Wheel assemblies	Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Shock absorbers	Monroe Auto Equipment Co., Monroe, Mich.
Wear plates	Manganese Steel Forge Co., Philadelphia, Pa.
Air brake equipment	Westinghouse Air Brake Co., Wilmerding, Pa.
Clasp brakes	American Steel Foundries, Chicago
Hand brakes	National Brake Co., New York
Brake shoes	American Brake Shoe Co., New York
Sash and hardware	Adams & Westlake Co., Elkhart, Ind.
Sash	Hunter Sash Co., Flushing, L. I.
Linoleum — cork	Armstrong Cork Co., Lancaster, Pa.
Insulation	Johns-Manville Sales Corp., New York Gustin-Bacon Manufacturing Co., Kansas City, Mo.
Underbody coating	J. W. Mortell Co., Kankakee, Ill.
Doors, formings	Bellanca Aircraft Corp., New Castle, Del.
Lavatories	Crane Company, Chicago
Hoppers	Dayton Manufacturing Co., Dayton, Ohio
Kitchen equipment	Angelo Colonna, Philadelphia, Pa.
Smoking stands	Harmo Distributing Co., New York
Glass and mirrors	Pittsburgh Plate Glass Co., Pittsburgh, Pa.
Seats	Warren McArthur Corp., New York
Radiators	Perfex Corp., Milwaukee, Wis.
Drape material	F. Schumacher & Co., New York
Engines, Diesel	Hercules Motor Corp., Canton, Ohio
Resilient engine mountings	Vibration Eliminator Co., Long Island City, N.Y.
Fans, engine	Coward-Eastman Co., Philadelphia, Pa.
Water pumps	Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Mufflers	Burgess Manning Co., Libertyville, Ill.
Sanding equipment	Prime Manufacturing Co., Milwaukee, Wis.
Cab heaters	Consolidated Car Heating Co., Albany, N. Y.
Windshield washers	C. A. Sprague Devices Co., Michigan City, Ind.
Fire extinguishers	Fyr Fyter Co., Dayton, Ohio
Traction motors	General Electric Co., Schenectady, N. Y.
Generators, alternators	International General Electric Co., New York
Batteries, Exide	Electric Storage Battery Co., Philadelphia Pa.
Batteries, Philco	Gould Storage Battery Co., Trenton, N. J.
Electrical fittings	Pyle National Co., Chicago
Relays	Allen-Bradley Co., Milwaukee, Wis.
Circuit breakers	Westinghouse Electric Corp., Pittsburgh, Pa.
Safetee glass, Kalistron	Waterhouse & Co., Webster, Mass.
Light fixtures	Safety Car Heating & Lighting Co., New York
Lights	Wiedenbach-Brown Co., New York
Telephone equipment	Raymond Rosen Co., Philadelphia, Pa.
Temperature control	Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Thermostats, Chronolox heater	Edwin L. Wiegand Co., Pittsburgh, Pa.
Blowers	American Blower Corp., Detroit, Mich. Buffalo Forge Co., Buffalo, N. Y.
Fans	Diehl Manufacturing Co., Somerville, N. J.
Air filters	Air-Maze Corp., Cleveland, Ohio
Electrical equipment	Crannell, Nugent & Krenzer, New York
Anemostats	Anemostat Corp. of America, New York
Grills	Barber Coleman Co., Rockford, Ill. Diamond Mfg. Co., Wyoming, Pa.
Locks	Yale & Towne Mfg. Co., Stamford, Conn.
Latches	United-Carr Fastener Corp., Cambridge, Mass.
Flexible hose and fittings	Aeroquip Corp., Jackson, Mich.
Metal hose	Zallea Brothers, Wilmington, Del.
Paint	E. I. duPont de Nemours & Co., Inc., Wilmington, Del.
Caulking and glazing compound	Parr Paint & Color Co., Cleveland, Ohio

wheels are lowered to the rail the assembly raises the front end of the unit to permit coupling and uncoupling and also movement of the unit independent of the train.

The A.C.F.-Talgo has been planned to show just one of many possible arrangements of the interior. There are eight double reclining airplane-type seats, with individual ash trays, in each passenger unit. These are spaced on 42-in. centers.

The wainscoting is 1/8-in. Plymetl and the headlining to the wainscoting is aluminum. The floor covering is 3/16-in. rubber. Double-glazed windows are used, two on each side being rectangular and two having semi-circular ends. Wheelbox covers are installed to conceal the opening between the cars and the wheels. As the floor level is only 18 in. above the rail the passengers walk between the wheels when moving from one unit to another.

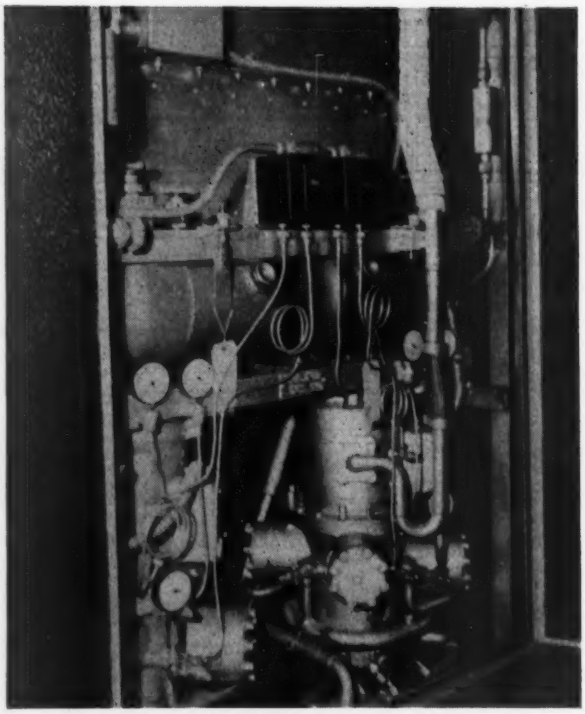
Designed and built especially for Talgo service by the American Car & Foundry Co., the locomotive is powered by four automotive-type Diesel engines. The two main engines deliver motive power and two auxiliaries supply all train power.

The locomotive has a service weight of 135,000 lb., a coupled length of 39 ft. 4 in., and a height over the horn of 12 ft. 6 in. It is equipped with single-end controls as the locomotive operates permanently as part of the train.

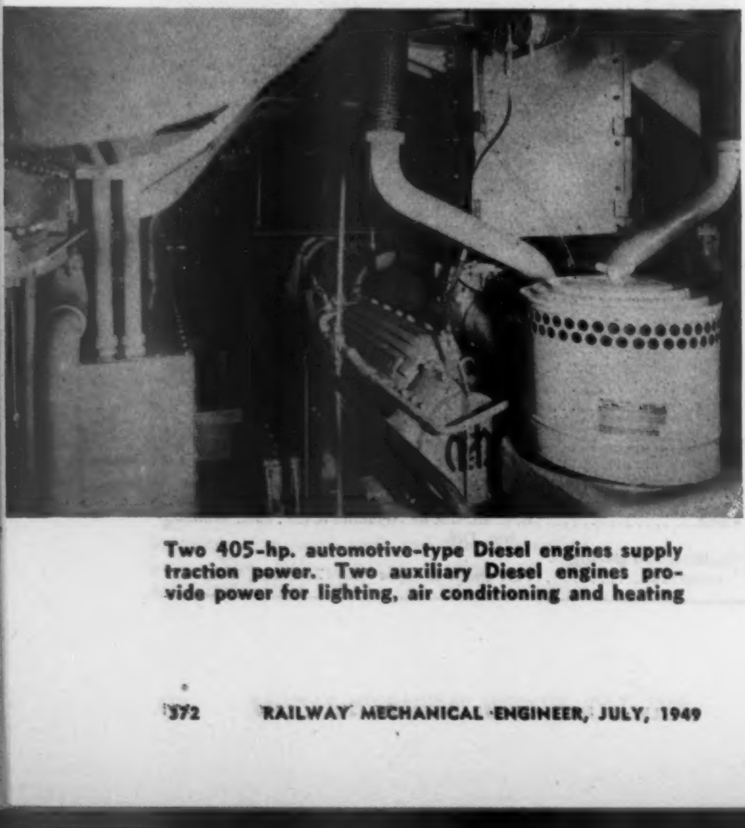
The Locomotive

The locomotive is of all-welded construction and the entire underframe is stress-relieved. Two 12-in. low-alloy high-tensile-steel channels spaced 42 in. apart form the center sills and only one cross bearer is employed. The wide spacing permits the main propulsion engines to be suspended as close to the rails as possible.

The main traction power plants consist of two 405 hp. Hercules, Model DNX-V8S, four-cycle eight-cylinder, vee type solid injection Diesel engines of 1,468 cu. in. piston displacement, direct connected to General Electric generators. These engines develop their rated horsepower at 1,800 r.p.m. and weigh 13.6 lb. per hp. delivered to the generator. The exciter and auxiliary generators are driven from the main shaft by vee belts. The auxiliary is used to charge the battery and to supply the direct current train line. The battery consists of four 32-cell sets of Exide type LX-25-G cells having a capacity of 201 amp.-hr. at the 8-hr. rate. It is used for engine starting and supplies auxiliary circuits when the engines are not running.



Air conditioning condenser in the equipment car unit



Two 405-hp. automotive-type Diesel engines supply traction power. Two auxiliary Diesel engines provide power for lighting, air conditioning and heating

The two traction generators are normally connected in parallel when the locomotive is in operation, but either of them may be used separately. There are four G. E. traction motors, nose-suspended and geared to the axles. The control station, in only one end of the locomotive, includes a controller with an idling and eight running positions.

The traction motors are force-cooled, the ventilating air being supplied by a Buffalo Forge Company blower, direct-driven by a General Electric, 5-hp., 2,880-r.p.m., 3-phase, 230-volt, 50-cycle motor. Compressed air for brakes is supplied by a Westinghouse 3YC, two-stage compressor, driven by a General Electric, 5-hp., 1,430-r.p.m., 230-volt, 3-phase, 50-cycle motor through vee belts.

Power for the blower and air compressor and also for train heating, air conditioning and lighting is developed on the locomotive by two-engine generator sets. These sets, mounted transversely near each end of the locomotive, consist of two 6-cylinder Hercules engines driving 3-phase, 230/108-volt, 1,500 r.p.m., a.c. generators each rated 100 kw. at 80 per cent

power factor. Each generator has a 125-volt, vee-belt-driven exciter.

The a.c. generators may be operated separately or in parallel, and synchronizing is automatic. When one machine is on the line, and it is desired to bring in the other, the second machine is started and allowed to come up to constant speed and voltage. Pushing a paralleling button drops the load from the first machine automatically, connects the two together at no load, and reapplies the load. This is done in a few seconds.

Heating, Air Conditioning and Lighting

Power for train requirements is distributed by two train lines. One is a 300,000 cm., three-phase, 230-volt a.c. line, and the other is a two-wire, 64-volt, d.c. line used for emergency lights in the coaches and markers. A neutral wire for the three-phase line is run with the d.c. line. These lines are run overhead in the units, on opposite sides, in rigid-metal conduit. They are terminated in sockets at the ends of each unit, and connection is made by flexible plug couplings.

The three-phase power is brought to a panelboard located at the center of each equipment unit. Secondary circuits from the board supply a refrigerant compressor, a grid-type heating element, a blower and the car lighting circuits. Ventilation, cooling, heating and lighting are supplied from the equipment unit to the two passenger-carrying units attached on either end.

There are two four-ton refrigerant compressors in each equipment unit, each weighing only 208 lb. The compressors are driven by 5-hp., 50-cycle, three-phase, a.c. motors. Cooling air for the compressors and evaporators is brought in and exhausted through a circular louver in the side of the car, while the 25 per cent of fresh make-up air is brought in through a grill on the same side.

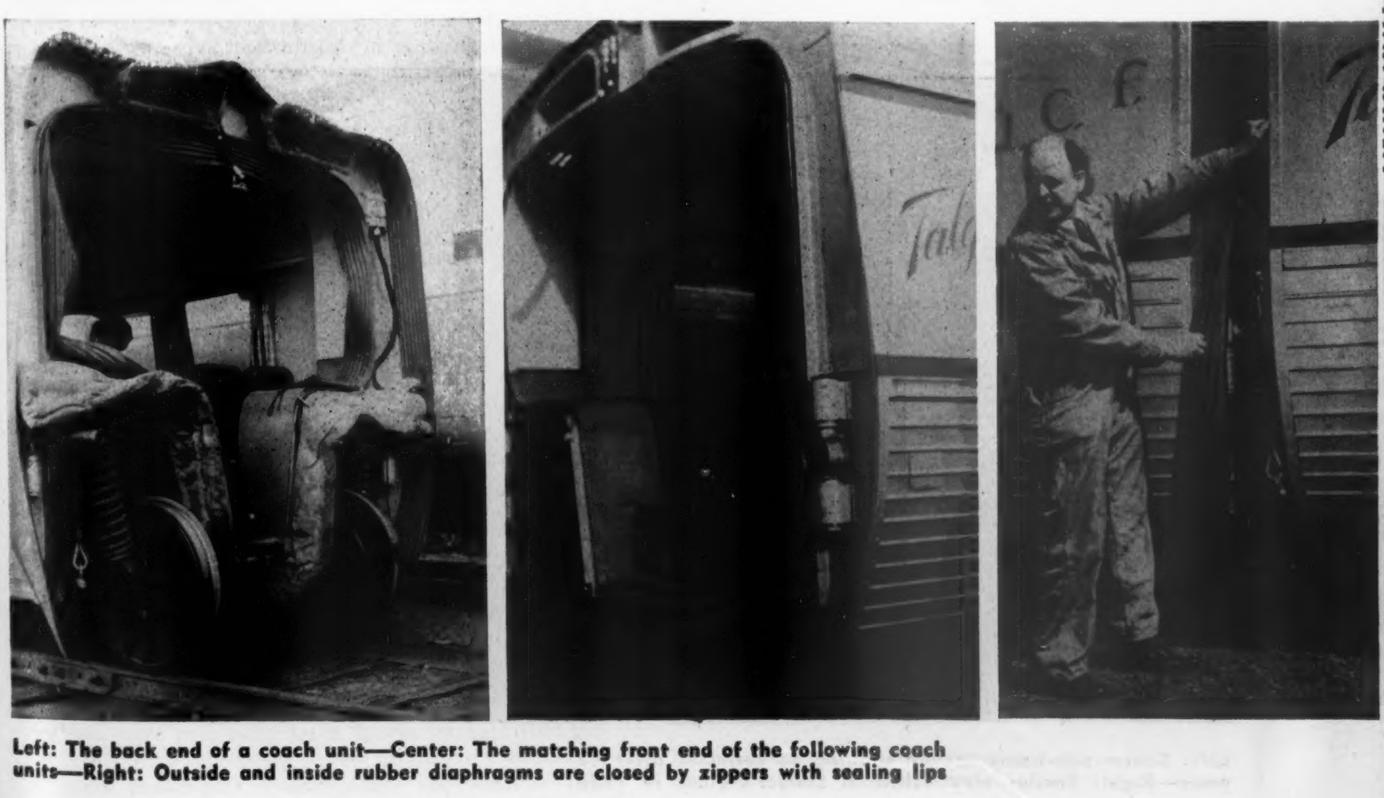
Conditioned air is delivered to each unit and return air is picked up from each unit by two Anemostats placed in the center of the ceiling. The air is supplied through overhead ducts, one on either side of center, by a motor-driven blower having a capacity of 2,000 cu. ft. per min.

Electrically heated grids are used for heating the units through the same ducts that are used for cooling. There are two banks of grids, each of 21 kw.

Electronic temperature controls, supplied by Minneapolis-Honeywell, are used to regulate both the air-conditioning and heating. The change from heating to cooling is automatic.

Each passenger unit is lighted by ten 36-in., 30-watt fluorescent lamps one inch in diameter. There are five on each side, arranged in a line over the windows. The lamps are in Plexiglas enclosures louvered on the lower surface and clear on top. Between the two fluorescent units at each end are tubular metal enclosures containing six-watt incandescent night or emergency lights. Light from these lamps is projected to the ceiling through openings in the tops of the enclosures. They are supplied from the 64-volt d.c. trainline.

The fluorescent lamps are operated on a.c. power at 108 volts, this being the voltage between any of the three-phase feeders and ground. The equipment car is lighted by 108-volt incandescent lamps in lens type units.



Left: The back end of a coach unit—Center: The matching front end of the following coach units—Right: Outside and inside rubber diaphragms are closed by zippers with sealing lips

The Denver Zephyr After 13 Years of Service

Renovated car just out of Aurora shops

Stainless steel train renovated after $4\frac{1}{2}$ million miles of operation shows no signs of deterioration

Left: Center side-frame section showing no corrosion after 13 years—Right: Similar view taken in builder's plant in 1936

Trucks were rebuilt with coil instead of elliptic springs

THE two 12-unit Denver Zephyr Budd-built trains of the Chicago, Burlington & Quincy which have been in regular daily service between Chicago and Denver, Colo., since November, 1936, have accumulated 4½ million miles per train. To renew the insulation and make other necessary changes and improvements, it was decided to give the trains a complete overhaul and work has just been completed on the second train. Units other than sleepers were overhauled at the Aurora, Ill., shops of the Burlington, and sleeping cars at the Calumet, Ill., shops of the Pullman Company.

With exterior sheathing, inside finish and insulation removed, the cars were stripped to the frames and an excellent opportunity afforded to inspect all parts of the stainless-steel frame construction which was found in an exceptionally good state of preservation after almost 13 years of service, with no evidence of corrosion either in the stainless-steel frame members or the Shotwelding. By contrast, carbon-steel conduit, junction boxes, occasional non-structural filler strips and low partitions were badly rusted and had to be replaced. Stainless-steel tanks were removed, cleaned, tested, and replaced in practically the same condition as when new. Two small cracks, each about 1 in. long, were found in the combination baggage and auxiliary power-car door sill, which required reinforcement due to loading in excess of the original design.

Floors Raised Slightly

Advantage was taken of complete stripping of the Denver Zephyr cars to raise the floors slightly. When the cars were originally built, it was thought that the relatively high operating speed might be disquieting to some passengers, consequently the window sills were raised so that windows gave more visibility over the landscape rather than near and down, thus minimizing the impression of speed. In actual experience, it was found that train speeds did not produce the

Thirteen-year-old Denver Zephyr car roof after being cleaned

effects anticipated, and the high windows proved inconvenient. By raising the floor heater pipes and grills and other necessary changes, therefore, new floors were installed 2½ in. higher than the original, with slight ramps at each end from car passageways to the new level.

Another major job was the replacement of all conduit and electric wiring with new materials superior to those available when the cars were built. All interior metal surfaces were sprayed with a preparation both for sound deadening and to prevent the formation of moisture by condensation. New insulation applied throughout and fitted to fill all spaces between the outside sheathing and inside lining is of the glass type. This pliable material, which tends to spring back to its original form after compression, is expected to stay in place under the long-continued and often severe vibration encountered in railway service.

Other Major Work

All paint on the Denver Zephyr car interiors was removed because of the accumulation of numerous coats over the years and attractive new color schemes were applied. All sponge rubber in seat cushions was replaced and all furniture re-upholstered. New carpets were installed, also new drapes and Venetian blinds.

Air-conditioning equipment, including evaporators, condensers, compressors, etc., was thoroughly overhauled. Because of the use of head-end power, these cars do not have battery boxes, but all other underneath parts were carefully checked, piping renewed, and newly insulated water tanks put in place.

In dining cars, the kitchens were rebuilt to permit the installation of dishwashing machines and electric coffee urns. In general, all parts of the kitchen equipment were thoroughly cleaned, repaired as necessary, and re-installed.

Coach end, with diaphragm removed, and tight-lock coupler

Diagonal strength member at car center showing perfect condition of stainless steel and Shotwelds after 4½ million miles of service

Coupler and Truck Repairs

Some of the units in the Denver Zephyr trains are articulated, while others have tight-lock coupler connections. In the latter case, the rear of the coupler shank has a ball, providing a universal joint. There is a front and back casting surrounding this ball, the rear casting acting also as a follower plate, and no draft gear being used. The ball, as well as the front and rear socket castings, wears. These worn parts were built up and remachined to their original dimensions, thus taking up all slack.

All trucks were completely dismantled, truck frames sandblasted, checked for any defects, and trammed, then built up and equipped with General Steel Castings roll stabilizers and coil springs in place of elliptic springs.

General repair work and remodeling of the two Denver Zephyr trains resulted in equipment which, from an appearance and potential service standpoint, will prove pleasing to passengers for another term of years.

PENNSYLVANIA EXPERIMENTS WITH "RADAR" COOKING.—Microwave energy developed for war-time radar, harnessed to provide the fastest method of cooking food ever known, has been adapted to a railroad car by the Pennsylvania, which is conducting experiments in so-called "radar" cooking. Cooking all parts of the food at the same moment, the Radarange unit requires only 15 sec. to cook hamburger, 45 sec for steak, and 2 min. for a half chicken. The unit, with an oven only 18 in. high, 19½ in. wide, and 20½ in. deep, is housed in a small temporary kitchen in the center of the experimental cafe coach.

Diesel Locomotive Engine Cooling System*

A study of the various schemes for driving the cooling fans and an analysis of the power requirements

By F. H. Brehob†

THE radiator fan drive system for cooling the engine on a Diesel-electric road locomotive in most cases uses more power in warm weather than any other auxiliary. Therefore, it is important that the entire radiator fan system with its drive be applied in an efficient manner so as to consume the least possible power. When these optimum conditions are present, the maximum amount of prime-mover output will be available for traction. Furthermore, the radiator fan system is important because it must provide the necessary ventilation to maintain the proper operating temperature of the Diesel engine through a wide range of ambient air temperature and engine load.

Since the radiator is inherently a fixed piece of apparatus, the variation in cooling requirements is met by controlling the radiator fan speed, or by having a multiplicity of fans which may be operated in varying numbers to give the desired amount of cooling. A water by-pass system for the radiator could be used to achieve this result, but such an arrangement is not generally employed on Diesel-electric road locomotives as it tends to waste auxiliary power and introduces the hazard of freezing the radiator at low temperatures.

Since the power required for radiator ventilating fans is so intimately associated with the radiator arrangement, it is important, first of all, that careful attention is given to the radiator application.

It is fundamental that a reasonable maximum amount of frontal area of radiator core be applied so the air velocity through the core may not be too high. Experience has proved that a core area which provides 800 to 1400 ft. per min. air velocity relative to the core face will result in a sufficiently low system pressure to keep the fan horsepower within reasonable limits. Increasing the core area will decrease the fan power required approximately as the square of the area, provided the entire radiator air duct system is increased in proportion.

The radiator core must have sufficient depth to increase the air temperature enough to keep the volume of air low. Generally, the rise of air temperature should be between 40 and 60 per cent of the difference between the maximum water temperature and the maximum outside air temperature for which the system is designed. Necessary louvers or shutters should be so arranged and combined with the air duct system that the air entrance and exit losses are kept to a minimum. Bends in the air stream and abrupt or frequent changes in air velocities must be avoided as much as possible. There must be a pressure drop of air through the radiator core in order to take away the heat. If the pressure drop through the entire system is greater than twice that through the core itself, there is just cause for doubting the efficiency of the entire system.

In order to minimize side wind effects, it is desirable that inlet air for the radiator be taken equally from both sides of the locomotive.

To obtain good radiator efficiency from the waterflow standpoint, there should be a sufficiently high velocity through the core to produce a turbulent

Fig. 1—Exterior of eddy current clutch and gear box a cross-section of which is shown in Fig. 3

* Abstract of a paper presented at the American Society of Mechanical Engineer's Oil-Gas Power meeting held at Chicago, April 25, 1949.
† Locomotive Engineering Division, General Electric Company.

flow, thereby obtaining good heat transfer from the water to the tubes. Further to increase radiator efficiency, sufficient water-flow should be provided by the circulating system so that the temperature difference between radiator inlet and outlet water does not exceed 10 deg. F. This will expose all parts of the radiator to a maximum temperature rise above the incoming air.

The cores now generally used, which have been found to give efficient performance, have flat tubes for the water with approximately 7/16 in. to 9/16 in. spacing, the tube measuring approximately 1/8 in. x 3/4 in. in cross section. The depth of the core may be fixed by three to six or occasionally more tubes in tandem to obtain sufficient temperature rise of the air passing through the core. Extensive use of fins on the air side of the tubes is the most economical method from a weight and cost standpoint of obtaining maximum radiator performance and, for that reason, fins are generally spaced eight to ten to the inch. One possible objection to a closer spacing is that the core may become clogged, due to foreign matter in the air, and require cleaning with compressed air, steam or other suitable means.

The Fan and Its Drive

There is a wide choice of radiator fans available in any type that may be selected, influenced by the type of drive and the pressure requirements of the system. To handle the maximum amount of air with the minimum amount of power, the fan must be efficient. A fan having a static efficiency between 45 and 55 per cent would be considered good for such an application. Fans driven direct from the Diesel engine are not desirable on road locomotives because of their fundamental lack of speed control. At present there are three different fundamental schemes of radiator fan drive in use which are described as follows:

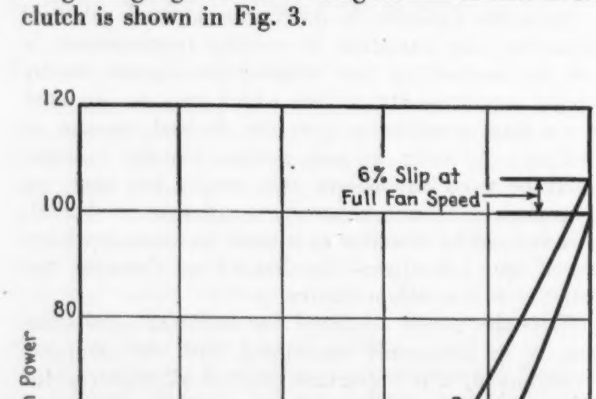
Scheme No. 1—A multiplicity of fans driven by induction motors receiving power from an engine driven alternator. With this system, the radiator fans, when in operation, run at a speed proportional to engine speed. Assuming that there are four radiator fans and four motors, the degree of cooling can be controlled by shutting down one or more of the fans. This is inherently a simple reliable system because it uses the simple induction motor. It is necessary, however, to add barriers to the air duct so that if all fans are not running, there will be no bypassing of the radiator, by air passing through the fans which are shut down. At any given engine speed, it is obvious that the power required for radiator ventilation will be in proportion to the number of fans running.

Scheme No. 2—A direct-current auxiliary generator is used to supply power for the radiator fans. This generator, driven by the Diesel engine, produces a voltage essentially in proportion to the engine speed. Since this same generator is used to supply power for the traction motor blowers, where a large speed range is undesirable, Ward Leonard control of the generator field is not suitable. However, it is practical to provide one generator field resistance step so that during periods of low ambient temperature, the voltage of the generator may be reduced to about 75 per cent of normal.

By employing two motors with two radiator fans, the desired flexibility of control may be obtained since the fan motors may then be connected to run in series or parallel across the generator. With the motors in the series connection each will be running at 50 per cent of generator voltage, the power consumption will be about 25 per cent and the air delivery about 60 per cent of that obtained with the fan motors in parallel across full generator voltage. Thus with the one step of generator voltage control, four different fan speeds are available, in addition to the shutoff condition.

Scheme No. 3—This scheme uses an eddy-current clutch to give the variable fan speed control. Its advantages over the other two schemes are that there are an infinite number of fan speeds available and that it is economical to use only one fan rather than two or more if its size can be made large enough. This scheme, however, is inherently less flexible from the design standpoint in its application to a locomotive than the others with motor drive, because it is necessary to have a mechanical power take-off from the engine or generator with line shafting and, generally, a gear box to obtain right angle drive from the horizontal power shaft to a vertical fan shaft.

Fig. 1 shows an eddy-current clutch, together with a right angle gear box. A longitudinal section of the clutch is shown in Fig. 3.



Curve A—per cent full speed hp. input to fan
Curve B—per cent full speed fan hp. input to clutch
Curve C—per cent loss of power in clutch neglecting excitation loss

Fig. 2

The outer rotor is mechanically connected to and driven by the Diesel engine. The inner rotor or hub assembly has a field coil for variable excitation supplied through brushes and collector rings as shown.

With zero excitation the outer member rotates freely, permitting the inner member to stand still and, since the latter is mechanically connected to the fan drive, the radiator fan is also at a standstill. When excitation is applied, the flux created enters the revolving outer rotor. This flux creates eddy-currents in the outer rotor which, in turn, cause a drag on the inner rotor making it revolve and drive the fan. Increasing the excitation increases the drag and, therefore, the fan speed.

The eddy-current clutch is particularly suited for use with a fan drive because the power required to drive a fan varies as the cube of the speed. When low fan speed is required, the fan will require a low torque. Even though the slip is high under this condition, the product of the slip times the torque, a measure of the power loss, will be low. At full fan speed where the torque is normal, the slip is low and the product of torque and slip is again low.

The power required to drive a fan in a fixed duct system varies as the cube of the speed and the torque required varies as the square of the speed. Torque multiplied by speed gives power.

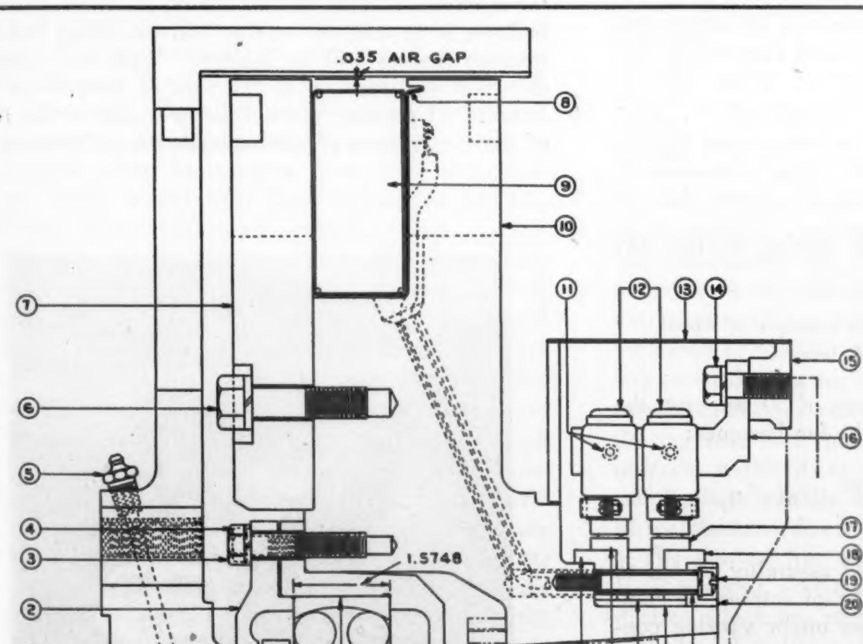
In Fig. 2, curve *A* is a cube curve and curve *B* is a square curve based on 106 per cent power to the fan drive. The 106 per cent power is derived from 100 per cent power to the fan plus 6 per cent slip power at full fan speed. It represents the fan power from the engine to the eddy-current clutch.

This shows that the maximum loss is about 18 per cent of the maximum fan power required and occurs at about 70 per cent fan speed, assuming that the slip at full fan speed is about 6 per cent of the full fan speed. In addition there is a small clutch excitation loss.

The eddy-current clutch has another desirable feature in that it is inherently a vibration damper and eliminates the need for any flexible couplings which might otherwise be required for a mechanical power take-off to a fan drive.

Power Requirements

In order to compare these three different schemes for economy of engine power used, the fan power required under maximum temperature conditions must first be determined. Assume that a 2,000-hp. engine is to be cooled, on which the maximum water temperature may be 190 deg. F. and under these conditions the engine is required to operate at full power at 110 deg. F. ambient temperature at times. This gives a difference of 80 deg. between air and water temperature. It is reasonable that the air going through the radiator could be raised to a temperature 40 deg. below the maximum water temperature which represents a rise of about 40 deg. F. Such an engine would have a heat rejection of



1—Outer rotor
2—Bearing cap
3—Cap screw and lockwasher
4—Cap screw and lockwasher
5—Grease fitting
6—Cap screw and lockwasher
7—Disk
8—Spring
9—Field coil
10—Hub assembly
11—Set screw
12—Brush holder assembly
13—Cover
14—Cap screw and lockwasher
15—Housing
16—Brush holder support
17—Collector ring
18—Ring insulation
19—Machine screw and lockwasher
20—Washer
21—Shaft (gear box)
22—Tube
23. Shell insulation
24—Spacer ring
25—Key
26—Bearing housing
27—Nut and lockwasher
28—Ball bearing
29—Flinger

Fig. 3

TABLE I—COMPARISON OF POWER REQUIREMENTS

		Horsepower to fans					Hp. supplied by engine-Scheme		
		Scheme 1 A.C.		Scheme 1 D.C.		Scheme 3 CL			
Approx. Ambient Temp.	Percent Vent'l'n. Req'd.	No. Running	Total Hp.	Cond.	HP.	HP.	1	2	3
110	100	4	60	100% P	60	60	76	78	65
85	80			75% P	31	31		43	43
80	75	3	45			25	59		37
60	60			100% S	13	13		20	24
35	50	2	30	75% S	8	8	40	13	16
—30	25	1	15				22		4

approximately 70,000 B.t.u. per min. Taking the specific air heat at 0.24, the weight of air to be handled by the fans would be

$$\frac{70,000}{40 \times 0.24} = 7,280 \text{ lb. per min.}$$ With standard air weighing 0.075 lb. per cu. ft., this means $$\frac{7,280}{0.075} = 97,000 \text{ cu. ft. per min.}$$

Since the fan is generally arranged to handle the warm air after it has left the radiator, the volume of standard air will be increased in the ratio of absolute temperatures as follows:

$$\frac{460 + 110 + 40}{460 + 70} \times 97,000 = 112,000 \text{ cu. ft. per min.}$$

The pressure against which this volume must be delivered by the fan could reasonably be composed of the following elements:

	Inches of Water
Cab inlet loss	0.1
Louver loss	0.15
Bend and acceleration / Loss between louver & core	0.10
Loss through core	1.00
Bend loss leaving core	0.10
Fan screen and exit loss	0.30
Total static pressure	1.75

The horsepower required for driving the fan may be given by the formula:

$$\text{Hp} = \frac{\text{cu. ft. per min.} \times \text{static pressure} \times 0.000157}{\text{Static Efficiency}}$$

Using a reasonable fan efficiency of 50 per cent, the horsepower required to drive the fan becomes:

$$\frac{112,000 \times 1.75 \times 0.000157}{0.50} = 61\frac{1}{2} \text{ Hp}$$

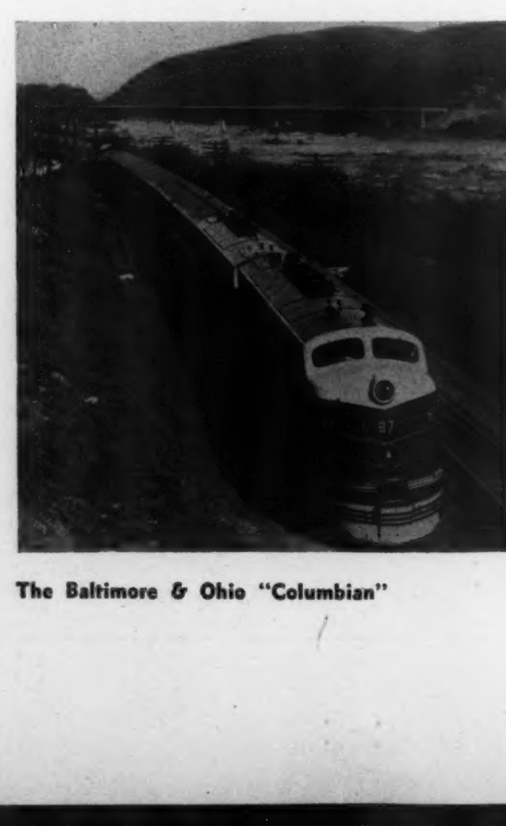
Rounding out this figure and assuming 60 hp. to drive the fan or fans, it will be of interest to compare the three different schemes under varying conditions of ventilation requirements. A variable efficiency for generator, alternator and d.-c. driving motors has been assumed depending upon load and the overall efficiency at full load. Somewhat better efficiency for the a.-c. drive than the d.-c. drive has been assumed. Table I shows the comparisons.

In the column headed "Cond." (Condition), under scheme No. 2, 100 per cent means that the generator has been set for full field together with full maximum voltage; 75 per cent means that the voltage has been reduced to 75 per cent of full load voltage and S & P indicate whether the radiator fan motors are connected in series or parallel.

It will be seen that in scheme No. 3, with the eddy-current clutch, the power demanded from the engine is always less than that required by scheme No. 1. At a point where only 50 per cent ventilation is required, which would occur at an ambient temperature of about 35 deg. F. under the conditions assumed, the saving in horsepower between scheme Nos. 3 and 1 is 24-hp. or about 60 per cent reduction over scheme No. 1. Scheme No. 2 in most instances is always better than scheme No. 1 except at full load and compares favorably with scheme No. 3.

While not associated with the subject of radiator fan drives, another consideration favoring either scheme No. 2 or 3 concerns electric drive of traction motor blowers. With either of these schemes, d.-c. driven traction motor blowers powered by series motors would be used. Due to the fact that the power of a fan falls off as the cube of the speed, the weakening of the series field tends to keep the speed up. This has the net result that if the idling speed of the engine is about one-third of the full speed and if the generator supplying the power for driving the traction motor blowers has one-third full voltage, the traction motor blower will nevertheless be running at about half speed and will deliver about 50 per cent of full speed air to the traction motors. This is a desirable advantage on a locomotive arranged for dynamic braking in that during the time dynamic braking is in use, the engine will be idling but the traction motors will be loaded. With this scheme they will still receive 50 per cent of normal air instead of 33 per cent normal air as would be the case of the a.-c. system of mechanically-driven blowers.

* * *



The Baltimore & Ohio "Columbian"

EDITORIALS

The Gas-Turbine Locomotive

In an article on another page in this issue, signed by officers of the two companies, the American Locomotive Company and the General Electric Company launch their gas-turbine locomotive, the first actually to be ready for operation in America, which will see service during the present summer on the Union Pacific. Considered as a commercial statement, the article discloses an amazing mixture of doubt and faith—doubt that anything practical within the measurable future, when compared with the Diesel-electric, will come of the attempt to adapt the gas turbine to motive-power use, but sufficient faith in certain favorable inherent characteristics to gamble in the hope of something worth while in the distant future. Certain it is that somewhere back of this development is a degree of faith in its future stronger than that expressed in the official joint statement, or it would never have been undertaken.

Unusual as it is, however, and even though it hints at something less than complete unity of purpose, the frank conservatism with which this statement estimates the prognosis is refreshing after the overenthusiasm which has characterized the history of gas-turbine locomotive development to date. At least three other locomotives have been projected, all of which would have been in service by now had early predictions been realized.

Simple as the gas-turbine power plant is, mechanically, it presents problems of combustion and of reliable combustion control which, even using liquid fuel, have not proved simple of solution and are much more difficult to deal with when pulverized coal is the fuel. Then there are the limitations of metallurgy which, to date, have been moved back far enough so that one-third of the total power developed by the turbine is available for useful work. With each increase in turbine-blade temperature made possible by further metallurgical developments this proportion will be increased, the volume of air which must be compressed will be reduced, and the idling characteristics will be improved.

There is no predicting if and when these metallurgical developments will take place. So the gas-turbine locomotive which we have to consider today is limited to inlet temperatures not to exceed 1,300 to 1,350 deg. F., and the demands of a suitable service life may make lower values desirable. These are high temperatures with which to deal when designing for the flow of the vast volumes of gas to be handled through the gas turbine and present a portion of the problems to be solved in the development of a successful locomotive.

It is well for those who expect to employ the gas-turbine locomotive to appraise its status with their eyes open. That does not mean they need lose faith that its inherent advantages will within reasonable time become available. Others are at work on the problems of this development and the fact that the Alco-G. E. locomotive is the first on the rails in America will not discourage them; it will spur them to renewed effort.

John M. Hall

John M. Hall's retirement as director of the Bureau of Locomotive Inspection closes a career which spans the entire life of the Bureau of Locomotive Inspection and of its predecessor organized under the original Locomotive Boiler Inspection Act of 1911. During this period he has participated in the achievements of the Bureau in reducing casualties among railway employees and the public caused by failure of locomotive parts. Throughout his service with the Bureau, first as district inspector, then as assistant chief inspector, and since 1935 as director, Mr. Hall has commanded the respect and has won the confidence and friendship of a host of railroad officers, not because at any time he has been lax in the performance of his duty under the law, but because he has insisted on a high standard of conformity with safety regulations and at the same time has preached the doctrine that the same high standard of maintenance required to conform to accepted safety standards is equally important in keeping the cost of maintenance down.

Throughout his service with the Bureau, Mr. Hall has had a reputation for fairness and square dealing which has prevailed even when the apparent interests of individual railroads and individual officers has not been exactly parallel with the duty of the Bureau. Always his constructive interest in improved locomotive service has so far impressed itself on the whole field that it has survived all temporary differences of opinion of the kind sure to develop at times between the officers of a railroad and those

responsible for a bureau charged with the duty of administering regulations which have the force of law.

One group of accidents which gave Mr. Hall special concern was crown-sheet failures, which seldom occur without a severe toll of casualties, including deaths. Whether because of his own experience in the locomotive cab as a fireman and engineman before his connection with the Bureau, Mr. Hall evidenced a keen understanding of the problem the men in the cab face whenever confronted with a case of low water. He worked for a like understanding on the part of railway officers responsible for discipline which would help to condition these men to meet with decision an experience which is of rare occurence in the life of any single crew. While this battle is not yet won, Mr. Hall's efforts have made definite headway toward victory.

That more than 500 of Mr. Hall's friends gathered at a testimonial dinner at Baltimore on June 9 to honor him for the services he has rendered the railroads during the 38 years he has been associated with the Bureau is very much what was to be expected in the circumstances. All of those present, and many more, wish him as much satisfaction in his retirement as he has earned by the character of his service with the Bureau.

Looking Around Can Pay Dividends

A frequently heard complaint of many railroad mechanical-department supervisors in both car and locomotive shops is that they are tied down to their job to such an extent that it is impossible to visit other facilities occasionally and thereby broaden their own knowledge and learn new ways of performing jobs that could prove highly beneficial to the road which employs them. Many sound arguments can be and have been advanced in favor of furnishing officers and foremen the time and opportunity to attend conventions and to visit other railroad shops at least of the type in which they are employed, as well as on occasion even visiting other industries. The task of selling this idea to management, however, is made difficult by the fact that it is not always easy to find tangible benefits that can be attributed directly to a given trip or to find specific examples of how the trip was justified.

It is therefore heartening to come across a good specific example of how a visit to an outside facility paid for itself many times over. In this particular instance a car department officer happened to spend a day visiting a non-railroad shop. While there he came across a method of fabricating steel plate which he thought he could apply to his car shop. After working out the details and putting his method of procedure into effect he found that he was able to reduce the man hours required to perform a certain job by more than 80 per cent. The cost of performing the job was reduced by an even greater figure because the new method required a smaller ratio of man hours paid at the mechanic's rate.

This one example of itself provides a strong argument for not only allowing but encouraging mechanical men to visit and inspect facilities on other railroads as well as other industries.

Time and expenses for such visits should be given to the top men in a department, of course, but should extend down to the gang foreman for he is frequently the one who is most intimately acquainted with details of particular jobs and will be able to spot opportunities that may be overlooked by the man concerned primarily with the broad overall phases of maintenance. Particularly at convention times should the advantages of men learning what their fellows are doing be kept in mind because these meetings offer an opportunity to learn what a great many people are doing on a large number of roads in a very short time.

Nose-Suspended Motors

Driving mechanisms and wheel arrangements for electric locomotives have been the subjects for four elaborately prepared papers published, respectively, in the October, 1948, December, 1948 (two), and April, 1949, issues of the Bulletin of the International Railway Congress Association. These papers deal with various forms of flexible drives such as links and joints, quill cup drives, Cardan shaft and discs, quill links carried on silent blocks, rubber cup drives, quills with various types of springs, etc.

Almost no mention is made of nose-suspended motors. Concerning them, one author says, "Of all the locomotives analyzed for the purpose of this report, one comes within this category, viz:—The British Railway, Southern Section. In this case, solid gearing is employed and the nose is suspended on rubber blocks."

Another author speaks of nose-suspended motors as follows: "The shocks due to irregularities of the track are transmitted directly from the axle to the motor and to the gears. As they are about proportional to the unsprung weight, these shocks are particularly great in this system of suspension and exercise a harmful effect on the track, the motors and the driving and running gear. The violence thereof also increases with the speed. This type of drive, although highly appreciated for low- and mean-speed vehicles is not suitable for high-speed locomotives." The term "high-speed" as used in the report is applied to locomotives operated at speeds in excess of 75 m.p.h.

All of this sounds a bit strange in the face of American practice. High-speed electric locomotives used in this country do employ flexible drives, but Diesel locomotives are electric locomotives with self-contained power plants and nearly all Diesel-electric locomotives in road service in the United States are built with swivel trucks and nose-suspended motors. Many of the passenger locomotives operate at speeds considerably in excess of 75 m.p.h. and freight train tonnages are measured in thousands rather than in hundreds.

To be sure, a Diesel-electric locomotive probably could not be designed economically to operate from an overhead trolley. This is because the straight-electric locomotive must be insulated against trolley voltage surges and if a Diesel were so insulated, it would have to be considerably derated. But in any case, the Diesel as used in America is still an electric locomotive operating at high speeds, hauling heavy loads and employing nose-suspended motors.

A basic reason for the difference is probably the fact that European and English trains are run on relatively light rail with parallel joints, but this could scarcely influence European thinking insofar as damage to the motors is concerned. To American engineers, the European situation is somehow reminiscent of the old American steam-locomotive practice in which each superintendent of motive power felt he must have his own locomotive, even though the difference between his and that of another road was only a matter of a few inches in the length of the boiler tubes.

But the experience of European engineers should not be discarded lightly. Americans are satisfied that the electric and Diesel-electric locomotives cause less damage to track than do steam locomotives, but certainly the heavier American track and heavier loads do not reduce the punishment taken by the motors. The American motors have to take it. They are designed to take it, but the circumstance is one in which they must be given the constant attention of the operating department and the best possible maintenance in the shops if their cost of maintenance is to be kept within the bounds of good economics.

Why Gild the Lily?

Diesel-electric locomotives have so many inherent, widely diversified and fundamentally important advantages that it is difficult to understand why even enthusiastic proponents of this type of power find it necessary to make unusually broad claims. It appears that this has been done in one committee report and its discussion at the annual meeting of the American Association of Railroad Superintendents, held June 13 to 16 at the Hotel Stevens, Chicago. This committee was asked to compare the advantages of spreading Diesel power over preferred runs on an entire railway system versus grouping the locomotives for complete Dieselization of a single division or subdivision. The conclusion reached was that the latter would produce greater economies, even though the ratio of replacement of steam by Diesel power was thereby reduced from four to one to two to one.

The report pointed out that with complete Dieselization of a division, only two types of Diesel power are required, whereas with steam power, seven types are necessary. There was also the case of one almost fully Dieselized railroad division of 950 miles where 165 steam locomotives in 1940 have been replaced by 100 Diesel units used in mutiples of one, two and three. Steam power on this division averaged 9,000 miles a month in passenger service, 6,000 miles a month in freight service, and 300 hours a month in switching service. With Diesel operation, these figures increased to 17,000 miles, 9,000 miles and 720 hours.

In listing other advantages of Diesel operation, however, the report mentions potential economies by the elimination of fueling and watering stations, water-treating plants, and locomotive wash racks. These are not complete savings. Diesel locomotives must stop after about 450 miles to take on fuel oil from more or less elaborate facilities, installed at appreciable cost; water, though relatively limited in quantity, is required for train heating and sometimes actually limits the length of a run under adverse winter conditions. While the volume of water requiring treatment is much less than with steam operation, the complexity of the problem and of the treatment required are actually greater. While wash racks at enginehouses may not be needed, Diesel locomotives must still either go through car-washing machines, or be hand-washed.

The report indicated that further economies can be realized by the standardization of Diesel spare parts. This has been a highly controversial subject especially with respect to trucks, truck parts and connections between units which often are not interchangeable. Constant improvements in the art of Diesel locomotive building frequently result in variations in engine parts from the same manufacturer for different engine models and there are four major builders and numerous smaller ones in the field.

Diesel power has so thoroughly established itself as a facility having exceptional advantages from the operating man's standpoint that transportation representatives may be forgiven for having a decided leaning toward the Diesel. As more and more units go into service, particularly on roads that are completely Dieselized, it must be remembered that the average performance will gradually become the accepted measure. This may be an opportune time to call attention to the fact that reports of this kind should deal with both the average performance and the special cases of an individual road or division. There's a lot of difference!

CAR INSPECTION AND REPAIR

Soo Line Builds All-Welded Gondolas

*By L. R. Vassick**

THE Minneapolis, St. Paul & Sault Ste. Marie is now constructing in its shops at North Fond du Lac, Wis., 200 general service all-welded gondolas. Plans for this construction program were originated early in 1948. The cars are being built in a well-lighted and well-ventilated shop on a production system, and, in order to obtain the utmost in utilization from tools and welding machines, construction is carried out during three shifts, the present rate being approximately 2½ cars a day.

Overhead cranes are used to handle material and assemble cars. Materials are stock-piled in convenient locations and transported by means of lift trucks and Chore Boys.

The cars are general-service drop-bottom gondolas of 50-ton nominal capacity—41 ft. inside length; 1,905 cu. ft., capacity level full. Each car has 16 drop doors—8 on each side—4 doors being operated from each corner of the car.

Fabrication of parts for the underframes was started as soon as steel plate and other raw materials were received. Parts were flame-cut on a newly installed Oxweld CM-23, 81-in. capacity, flame-cutting machine. Portable CM-16 cutting machines were used for fabricating smaller parts.

There are approximately 300 flame-cut parts on each car. From the time fabrication was started, the large cutting machine was used on a three-shift basis. On many of the small parts, five blowpipes are used at one time on this machine. Although no stack-cutting is done, templates are used as much as possible, in order to permit continuous cutting across large plate areas. By avoiding stack-cutting, set-up time is shortened. As shown in one of the illustrations, two nozzles per blowpipe are used to trim the edges on side stakes. While cars are being assembled considerable manual flame-cutting is done, such as trimming ends, cutting slots and other openings in center sills.

Only the end and side-sheet connection angles, side stakes, and outside side sills are hot formed—all other parts being pressed cold. All dies used were manufactured in the shops at North Fond du Lac.

The majority of the parts being welded are of low carbon open hearth steel—A. A. R. specifications. A few parts such as the coupler strikers and rear draft stops are of alloy steel.

Ninety-eight per cent of all welding is down-hand, which not only expedites the work but, because it is a more simple and efficient operation, affords better welds.

For the first operation, two center sill channels are placed on metal horses while the rear draft stops and front lug castings are applied and welded. The

* Supervisor, freight car department, Soo Line, Minneapolis, Minn.

Center-sill jigs where plates, coupler parts and door hinges are welded in place

Multiple flame-cutting machine with 81-in. work table

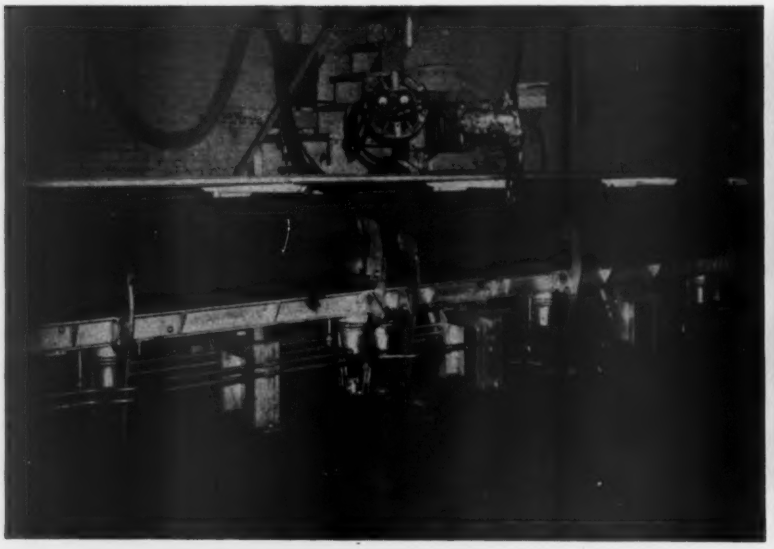
channels are then placed on a Unionmelt jig and, by means of air cylinders, are pulled and clamped in place with the required amount of camber. Submerged-arc automatic welding is performed with one Unionmelt UE head on a CM-37 carriage. The carriage and welding head are mounted on a 50-ft. track. The latter is mounted on swivel arms, held on columns attached to the center sill welding jig. If it is necessary to move the jig and welding machine track, the entire set-up may be moved as a unit.

The melt recovery unit is located on a platform just above the welding machine. The vacuum type recovery unit recovers and reclaims surplus melt material. Current for automatic welding is supplied by two 600-amp. capacity d. c. generators operating in parallel. Automatic welds are made with $\frac{3}{16}$ in. No. 36 rod and No. 90 melt. For most work, 825 amp. at 32-volts is used. With only one automatic machine and carriage, it is possible to weld bolsters,

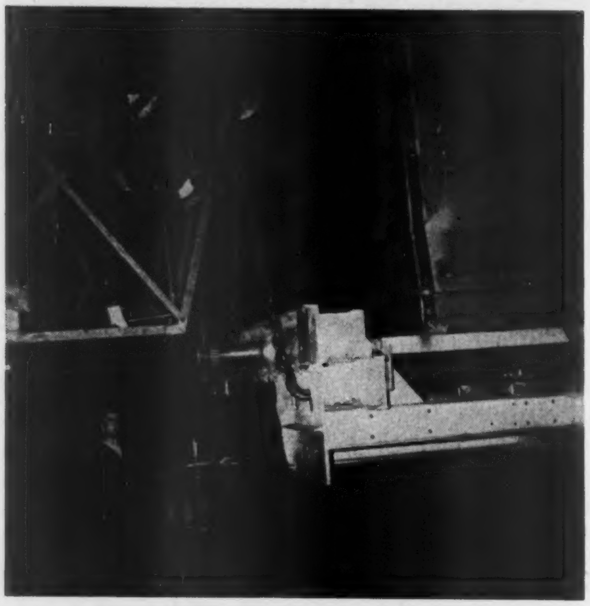
Set-up with five dual blow-pipes to trim side stakes

Jig for automatic welding of underframe cross-ties

Jig for automatic welding of bolsters and cross bearers



Left: Automatic welding of H-beam to the top of the center sill—Right: Welding bulb angle to side sheets—Blow pipe precedes welding—Note the melt buggy



Placing master jig in air-motor-operated end of positioner

One of the master jigs for underframe assembly by down hand welding

cross-ties, cross bearers, center sills, and sides—an arrangement found to be the most economical that could be devised for automatic welding.

To speed up the welding of underframe members, such as bolsters and cross-ties, consideration was given to the design of holding jigs so that all parts would be uniform and could be tack-welded in place before final welding with the automatic welder. Copper back-up bars are used, and a series of springs hold the copper bar firmly against the parts to be welded.

In welding the edges of the Z-bar center sills, full penetration is obtained. It is important that, during welding, there be no excess metal at this weld, which would prevent obtaining a close fit between the H-beam and the center sills. While the Z-bar center sills are still in the jig, the H-beam is placed in position with clamps operated by air; then welded automatically with a $\frac{5}{8}$-in. fillet weld on each side at the base. The procedure is the same as that used in welding the center sills. After the welding is completed, air is admitted to all cylinders and the clamps unlocked. Air is admitted to two cylinders which raise the welded center sills and H-beam off the jig.

The next operation is to place the center sills in the positioning jigs, which may be turned to hold the work in any position for welding. In these jigs, hinges, draft lugs, strikers, brake lever supports, and air brake equipment brackets are applied and welded. Draft gears and draft gear yokes are installed and draft gear carrier irons applied and secured with bolts. Impact wrenches are used to tighten nuts.

The center assembly is now ready for the master jigs—three of which are used. After the center sills are in place, the body bolsters, cross ties, cross bearers, and side members are placed in the jig and clamped. After these parts are in position, the entire underframe assembly is tack-welded. While the master jig is still on the floor, side stakes, sides, and ends are placed in position and tack-welded. All possible down-hand arc welding is completed before the master jig is placed in the positioner.

This positioner is a shop-fabricated device that permits the master jig containing the entire car assembly to be turned to any desired position so that final welding may be performed down-hand. The entire assembly mounted in the positioner may be turned by means of gearing and an air motor attached to one end of the positioner.

After all welding has been completed, the car superstructure is lifted from the master jig and placed on its trucks. Operating shafts and door chains are applied, and the car is then moved to another building where the hand brake, train-line pipe, and air brake equipment are applied. The car is then moved to another location on the same track, where safety appliances are attached by means of riveting. Finally, the drop doors are applied, and the car is weighed and moved to the paint track where it is sandblasted, painted, and stencilled.

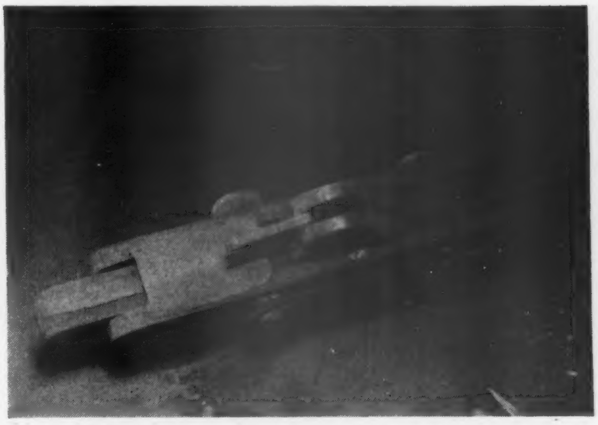
The gondola side straightener in position for forcing outwardly bulged car sides in

Straightening Sides on Gondola Cars

The Elgin, Joliet & Eastern shops at Joliet, Ill. use a straightening device for gondola car sides which corects either inward or outward bulges. The four essential parts of the device are (1) a vertical plate with a series of holes, (2) two legs, which when the vertical plate is in the center of its travel, are about 60 deg. to the vertical plates, (3) the necessary guides for restraining the vertical plate and one end of each leg to vertical motion and the other ends of the legs not attached to the vertical plate to horizontal motion, and, (4) a chain to suspend the straightener from the crane. The ends of the legs opposite the vertical plate are connected to members with two pairs of jaws. One pair contacts the inside of the car sides for outward forcing of the car sides; the other contacts the exteriors to force the car sides in.

After the bent portions of the side sheets are heated by a torch to a mild red, the straightener is set in place across the top angles of either car side with the overhead crane. When the sides have been bulged outward the straightener is positioned with the legs sloping upward as shown in the illustration. A pair of jaws, one on each extremity of the cross bar, fit on the outside of each car side. These jaws are attached to the outer ends of the legs through a member which slides horizontally in the main cross bar. Thus, as the crane is raised, the upper ends of the legs are raised and the lower ends drawn together. This moves the jaws toward each other and corrects any outward bulge in the side sheets.

If the sides have been bulged inward, thus requiring forcing outward, the straightener is set in place upside down to the position shown in the illustration, and the crane attached to the other end of the vertical bar. A second pair of jaws then fit inside the side sheets. Raising the crane with the straightener in the new position then forces the far ends of the legs outward, and this force is transmitted to the inside jaws to force the inwardly bulged portions of the sheets outward until the entire side is straight.



One end of the side straightener showing how the leg connects to the crosshead and the crosshead to the inside pair of jaws

The main cross member is made up of two lengths of steel plate 1 in. by 5 in. joined $2\frac{1}{2}$ in. apart at the bottom to a third length by arc welding to form an open-top box section. Two slots $1\frac{3}{4}$ in. by 10 in. are cut in each of the two sides on each end to accommodate two crossheads, or sliding members. Each of the two crossheads is made from two $1\frac{1}{2}$-in. bolts jointed together near the ends by a 14-in. long section of $\frac{1}{4}$-in. plate. Each bolt slides in its own slot, giving the crosshead a total travel of 10 in., the length of the slots. One end of each leg is joined to its crosshead by the inside bolt fitting through an eye in the end of the leg. The other end of the crosshead is joined to the two types of jaws, one for pulling in and the other for pushing out the sides.

The vertical member is made from plate $\frac{1}{4}$ in. by 4 in. It is joined to the ends of the legs by $1\frac{1}{2}$-in. rivets. An opening is cut in the center of the bottom plate of the main cross member to permit the vertical member to move up and down with respect to

the cross member. Holes $1\frac{1}{4}$ in. in diameter are drilled in the vertical member every $2\frac{1}{2}$ in. to keep the various parts of the straightener from moving while it is being transported.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. A. R. Mechanical Division renders decisions on a large number of questions and controversies which are submitted from time to time. As these are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Responsibility for Buckled Center Sill

Baltimore & Ohio box car 177518 arrived home carrying Norfolk Southern information card dated May 20, 1946, showing center members bent in excess of $2\frac{1}{2}$ in. when received from the Atlantic Coast Line. The B. & O. requested information from the N. S. showing how damage occurred in fair handling, or in lieu thereof, defect card to cover. The request was denied as the N. S. claimed the A. C. L. delivered the car to them on April 19, 1946, with defective sills. They further stated exceptions were taken by their inspector, and arrangements were made to move the car to destination in order to save time and expense transferring lading. This arrangement, they claimed, was made with the understanding that the A. C. L. would accept the car back without any exceptions, and as they contented it was an A. C. L. responsibility, they did not handle with the B. & O. in accordance with Rule 120. The B. & O. then handled with the A. C. L. who claimed there was no record of exceptions taken by the N. S., and as they found no record of any Rule 32 condition while the car was in their possession, they also declined to furnish the B. & O. any protection. The A. C. L. further stated damage was found upon arrival by the N. S. inspectors and would be owner's responsibility in accordance with Interchange Rule 44, Note E, the car having been set off on the interchange track and without switching occurring prior to damage.

The B. & O. stated that they received the car with an N. S. information card showing two bent sills, and that they requested the N. S. to show how the car was damaged in fair service or to issue a defect card to cover. The N. S. declined any responsibility, stating that they returned the B. & O. car to the A. C. L. in the same condition they received it. Correspondence failed to obtain any information required by Rule 44, except an A. C. L. statement that there was no record of any Rule 32 condition and that defects were owner's responsibility as per Rule 44, Note E, the claim being based on the fact that the damage was discovered upon arrival before any switching was done. At this point the B. & O. pointed out that conflicting statements were made regarding exceptions taken, and that the damage was not discovered upon arrival at the interchange point. The A. C. L. advised the B. & O. that they had correspondence with the N. S. covering the B. & O. car which was delivered to the N. S. and no exceptions taken. When the A. C. L. received the car back and attempted to give it to the Norfolk & Portsmouth Belt, that line refused to accept it without an information card. This was furnished by the N. S. even though they claimed that the A. C. L. had previously delivered the car to them in defective condition. The B. & O. felt that the reference made by the A. C. L. regarding damage discovered upon arrival on the N. S. did not agree with other A. C. L. statements about "No record of exceptions at time of delivery." The B. & O. also felt that another statement regarding a car inspector's signature on the information card discovered on arrival and such card issued months after the protest did not agree with the N. S. inspector's report that the damage was discovered before switching. The N. S. trainmasters report also indicated that a switching move was involved, and therefore the B. & O. considered Note F of Rule 44 and Section I of Rule 4 applicable. They also considered that the A. C. L. statement that no Rule 32 condition was involved did not conform to Interpretation I of Rule 44.

The A. C. L. contended in their statement that the car had traveled 444 miles over the N. S. and two other lines from the time it was delivered by the A. C. L. to the N. S. until returned to the A. C. L., and that it was doubtful that the car would have been permitted to travel this distance if the center sills had been buckled. The A. C. L. had no permanent record of any agreement with the N. S. that the car was damaged when delivered to the N. S. and that the A. C. L. would take the car back. In its statement, the N. S. reiterated the claim that the buckled center sills were discovered upon delivery of the car by the A. C. L., and that there was an understanding between the joint A. C. L.—N. S. inspector and an N. S. inspector that the A. C. L. would take the car back with the buckled sills without the N. S. being held responsible for the condition of the car.

In a decision rendered November 11, 1948, the Arbitration Committee considered the Norfolk Southern responsible and that the N. S. should issue a defect card to cover all Rule 44 damage. *Case 1829, Baltimore & Ohio versus Atlantic Coast Line and Norfolk Southern.*

Evidence Required to Sustain Open-Flame Damage

At various times during 1946 and 1947 six asphalt cars were delivered to the General American Transportation Corporation by the Kansas City Southern with from 8 to 20 sq. ft. of paint and stenciling damaged, and with one steam-jacketed outlet chamber broken on each car. The K.C.S. refused to issue

defect cards, claiming that their investigation developed that open flame was not used in unloading. The car owner's contention was that an open flame was used as the defects were the result of fire damage, and that a defect card should be issued as per Rule 32, Section (10) (k) and the note following.

The owner signed the preceding agreed statement of facts under protest; their original statement of facts included the words, "account fire damage," after the broken outlet chamber in each case. The K.C.S. refused to sign such statement as their signature would be an agreement that they delivered the cars with fire damage. The owner submitted an affidavit from one of its representatives together with copies of a formal request to the K.C.S. who, the owner stated, did not take exceptions to the fact that the cars were not fire damaged or that the claim was in order. The owner did not agree with the K.C.S. position that high steam temperatures caused the center sill paint to break down, giving the appearance of an open flame being used, because the cars were not unloaded in extremely cold weather. The owner further felt that this condition would have been experienced long ago, if it existed, and that the cars have ample coil heating lines to unload asphalt with saturated steam. The owner cited a case in which damage was assumed by the handling line even though the parties unloading the car stated that open flame was not used. The owner contended that present rules provide that when a car bears evidence of open flame and paint and stenciling are damaged, defect cards should be issued which include the steam jacketed outlet nozzle directly associated with other cardable defects as per Rule 32, Section (10) (k) and the note following.

The K.C.S. stated that they handle a great number of asphalt cars, and that where open flame was found to have been used, protection was furnished the car owner. On the six cars in question, no such evidence was found, and the defects must have developed from other causes. The cars were loaded with a very low grade of asphalt which requires a high temperature for liquefaction, and before each shipment the heater coil system is tested. Any damage would, therefore, occur on the trip previous to the date of claim. The cars are in severe service; temperatures up to 750 deg. F. have been necessary to unload. This has processed the asphalt into coke, and it has been necessary to chip the coke from the tank and heater sides before reloading. The sudden change from sub-freezing temperature to 750 deg. could crack the cast iron outlet chamber, or it could have been cracked from causes other than an open flame and properly charged to the car owner. The K.C.S. produced statements by those responsible for the unloading in each case to the effect open flame was not used. The cars were received on the K.C.S. at points where interchange inspectors are located, and there was no record of fire damage when received. The K.C.S. contended that Rule 32 Section (10) (k) states that handling line is responsible only when open flame is used,—not merely "evidence" of. Arbitration cases 1494 and 1757 covered cases where paint was missing, and in each case the owner was responsible. The K.C.S. thought the case similar to No. 1720, since there is no positive proof that an open flame was used and since the unloading parties stated that an open flame was not used for unloading.

In a decision rendered Nov. 11, 1948, the contention of the car owner was not sustained as there was no conclusive evidence that damage to the cars was the result of an open flame to facilitate unloading. *Case 1830, General American Transportation Corporation versus Kansas City Southern.*

Jib Crane For Passenger Car Work

A high-capacity jib crane, located just outside the San Bernardino, Calif., passenger car shop of the Santa Fe is shown in the illustration, being used for various heavy lifting operations and also relatively light work such as the application of roof-mounted air-conditioning units in passenger cars, as shown.

This jib crane is supported from a stiff-leg steel frame mounted in heavy concrete blocks set in the ground and having a 30-ft. vertical mast with two legs spaced about 90 deg. apart. The mast is a 15-in. I-beam, also the boom which is 22 ft. long and hinged to the mast at a point about 22 ft. above the ground. The boom is equipped with a 6,000-lb. pneumatic hoist, giving it capacity to handle any loads up to this amount with safety.

Jib crane and pneumatic hoist used to apply air-conditioning-unit in passenger-car roof

SHOPS AND TERMINALS

Tool Room And Tool Crib

All tools for the Northern district of the Southern Pacific are made and hardened at Sacramento, Calif., general shops also special tools for other points on the S. P. system. An average of 1,150 tools per month are made and hardened at the Sacramento tool room.

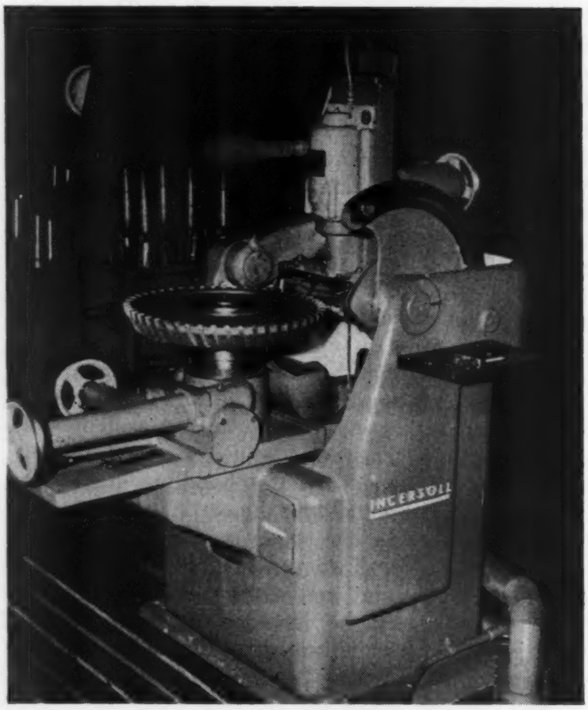
Various types of tool steels are used consisting of high speed, hot work and various grades of carbon tool steels. High speed steel is used for tire and wheel-forming tools, milling cutters, reamers, taps and various other tools. Hot work steel is used for forging machine dies, headers and inserts, also hot work shear blades.

Carbon tool steels are used for taps, reamers, pneumatic tools and chisels, rivet sets, punches, shear blades and certain forging machine dies and headers.

All hardening is done in a separate department which is modern and well equipped for handling all types and sizes of tool steels. An interesting feature of this department is that the hardening furnaces and quenching tanks are arranged in two fractions of a circle to reduce time of handling from furnace to quenching tanks.

There are three electric furnaces, one electric air—draw oven and one electric salt bath all thermostatically controlled. There are four quenching tanks all equipped for controlled heating and cooling. An electric overhead traveling one-ton crane is used for handling heavy parts.

Tool crib in machine shop



30-in. milling cutter grinder in Sacramento shop toolroom

All hardening is done in a controlled atmosphere which is prepared in a special gas generator using charcoal. The gas is pumped under a slight pressure to all furnaces and consists of approximately 30 per cent carbon monoxide (CO), 16 per cent hydrogen (H_2) with the balance consisting of nitrogen (N_2). The carbon dioxide (CO_2) is kept below 0.5 per cent by making daily analysis.

All furnace doors are equipped with a flame curtain to exclude outside air when the door is open.

Also in this department is an Olsen Brinell hardness tester as well as a Rockwell machine and daily checks are made for control of hardness. The Ingersoll cutter grinder, illustrated, is used for the quick and accurate grinding of all milling cutters up to 30 in. in diameter.

In line with the general modernization of the Sacramento machine shop a modern tool crib was recently installed, as illustrated. This tool crib is unique in a number of respects, primarily its large capacity in a small space, orderliness and ease of locating any desired small tool.

The average tool crib in a railroad shop is often a place for collecting dirt, has little system, and in the former design at the Sacramento machine shop occupied an area of 600 sq. ft. In the present improved design, the area has been reduced to 280 sq. ft. with the same number of tools as were kept in the old crib. This has been accomplished by installing a series of metal drawers, 18 and 24 in. long and mounted on four rollers per drawer for ease of movement.

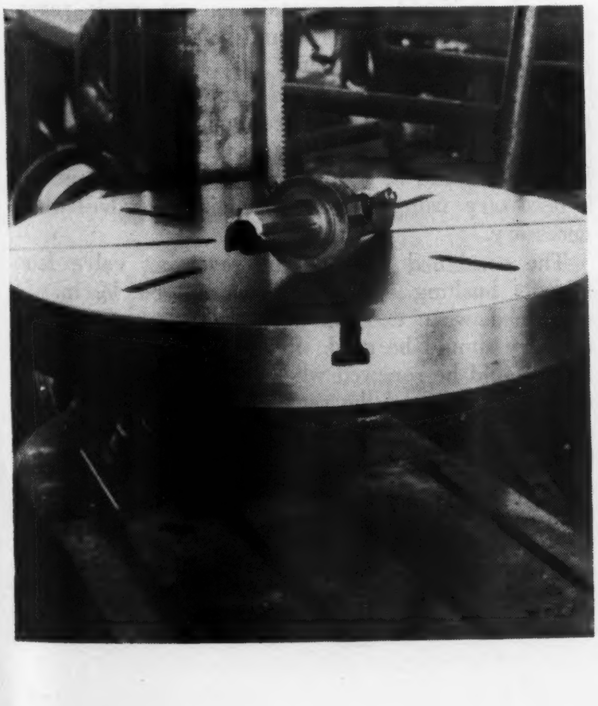
There is a correct place for every tool, yet looking into the crib not a tool is exposed. In general, small tools are kept in the upper drawers 2 in. or more deep and larger tools in lower drawers, some of which are 12 in. deep. An efficient tool checking system in conjunction with convenient removable index cards enables the attendant in this tool crib to find all small tools readily and know just who is using them in the shop.

Painted in colors of green and aluminum, the tool crib has a pleasing appearance, both inside and out. It has proven so successful that other tool cribs throughout the shop have been built along the same lines.

Hollow Drill To Remove Test Specimens

A hollow drill made by silver-soldering carbide tips to a used piece of piston rod is employed to remove circular specimens of metal for testing purposes at the Marshall, Tex., shops of the Texas & Pacific. The three tips are set to drill out a cylinder section 1 1/16 in. solid in diameter, with the cutting tools being set for clearance by relieving on the back inside. Coolant water is fed to the tips for cooling and to wash away the shavings.

Hollow drill to remove test specimens uses water as a medium for cooling and for washing away shavings



The coolant water is fed to the hollow drill through a ⅜-in. pipe which carries the water to a chamber inside a brass collar; the drill turns inside this collar while the collar remains stationary. The collar is about 3⅛ in. in diameter and has an internal ⅜-in. groove cut in the inside circumference. The water enters this groove directly from the feed pipe and is distributed to three ¼-in. ports. It emerges from the three ¼-in. ports just below the collar and is forced down the inside surface of the drill. The coolant is retained within the chamber while the drill is revolving about the collar by two bronze piston rings of the same general design as is used in automobile pistons and located on each side of the ⅜-in. groove.

Maintaining Air Compressors*

Air compressors should be overhauled at some general shop on the railroad, a record of repairs kept in book form and a metal tag appliaed to the side of each compressor to show the serial number. Compressors returned to the shop for general overhauling should be thoroughly cleaned in boiling lye or some other suitable chemical. Care should be taken when removing piston rod nuts not to damage the end of the rod. When pulling air heads from pistons a special puller should be used; under no circumstances should a sledge hammer be used on the end of the piston.

When stripping a pump, care should be taken not to damage the reversing rod or valve. Parts being placed in the basket to be put in the lye vat should be handled carefully to avoid damage, with special care given to pistons as the rods and ring grooves are easily damaged. After overhaul air compressors should be put on a test rack and pass tests recommended by the brake company.

When cylinders are ground all four lugs must be in line to make a bearing. A special gauge should be provided for all pumps and should be used.

Machining Piston Heads and Rods—When fitting piston heads to cylinders the following tolerances must be allowed: Pistons up to 10 in. in diameter to be turned .001 in. per in. of diameter smaller than the cylinder; on pistons above 10-in. diameter, a flat .010 in. smaller in diameter than the pistons should be allowed.

Ring grooves in pistons should never be filed. The piston rods should be ground at each overhauling, and condemned when 1/16 in. smaller in diameter than original size.

Air piston heads that do not require pulling down

* A report presented at the 1948 annual meeting of the Air Brake Association, Chicago.

on the rod before touching the shoulder should be renewed.

All pistons should be kept standard length, and the taper fit should not be machined. The final fitting of piston heads and rods should be checked for length and no clearance allowed. All heads should be line-and-line with the cylinder faces.

Repairing piston rods by welding on new ends or building up taper fits should be prohibited.

Tappet plates on steam piston heads must be examined for looseness and to see that the reversing rod hole is not worn enough to mutilate the button on a new rod.

Machining Cylinders—All cylinders should be ground (trued up only) and scrapped when ¼ in. over original diameter. Cylinders must be mounted on a center piece and set up on a Micro-grinder to face before grinding. No grinding of a single cylinder should be permitted. Related cylinders on the same pump should not differ from than ⅛ in. in diameter. The related diameter of a new pump controls these limits.

When grinding cylinders the counterbore must be maintained standard, and the stuffing boxes cleaned up to assure alignment. If stuffing boxes are loose or the threads bad, remove the dowel pin, tighten and relocate the dowel pin at a new spot.

By-pass ports in the low-pressure steam end of 8½-in. cross-compound compressors must be maintained to standard dimensions as follows: Length 2 in., width ⅝ in., depth $\frac{3}{16}$ in.

All cylinders should be removed from the center piece and new gaskets applied when a compressor gets a general overhauling. This to be done before cylinders are ground.

When new stuffing boxes are applied, the rod fit portion should be $\frac{1}{32}$ in. larger than the rod and condemned when $\frac{1}{16}$ larger than the rod. The stuffing box glands should be a sliding fit on the rod and $\frac{1}{32}$ in. smaller than the stuffing box. Stuffing boxes and stuffing-box nuts having defective threads or lugs should be renewed.

The standard draw on taper piston, dimensions between heads, and draw on pistons is:

Type of Compressor	Draw, in.	Standard dimen. between heads, in.	Min. Dim. betw. heads, in.
No. 2	3/64	16-5/16	16-9/32
No. 6	1/32	18-23/32	18-11/16
No. 5	1/32	21-11/32	31-5/16
No. 9½	3/64	18-11/16	18-43/64
No. 8½ CC	1/32	22-1/16	22-3/64

Air Valves and Seats—All valves on the No. 5 type of compressors should have an air valve lift of $\frac{5}{32}$ in. On the 8½ CC, the 9½ and the 11-in. the lift is $\frac{3}{32}$ in. for all valves.

All air valve cages should be a good fit in the threads, with the slot not exceeding ⅛ in. in width. A standard lift gauge should be used on all valves and the gauge checked weekly. Always adjust the valve lift on the wing valve boss, and not by machining the stop in the chamber cap or cylinder.

New air valves should be applied when wings on the valves become $\frac{1}{32}$ in. smaller than the seat or the valve will roll and pound the seat out of shape.

Upper valve caps should have a light bearing on valve seats to act as a check to prevent the valve seat from working loose. Lugs on caps should touch the seats. Threads on valve seats, valve cages, tap screws and caps should be coated with graphite and oil before being screwed into place. Special reamers should be used on upper valve seats instead of removing seats. The seats should be renewed when worn too low to take a standard wing valve.

Fitting Rings—Rings should be fit to a hand turning fit in the piston groove, and condemned when width is .005 in. smaller than the groove. When ring grooves in pistons are worn, the grooves should be trued up to .006, .012 or .018 in. oversize widths for standard oversize rings furnished for these sizes. A file should never be used on sides of ring or in ring groove. Oversize rings must not be used in cylinders.

Steam and Air Heads—On No. 2, No. 5 and No. 6 steam heads the bushings should be renewed when worn over $\frac{1}{32}$ in. The piston rings shoulid fit to the cylinder walls with .003 in. clearance between the ends.

Careful attention should be given to threads in the pipe connection to the heads. Reversing valve bushing caps should be ground in when copper gaskets are not used.

A standard condemning gauge furnished by the manufacturer should be used on reversing rods for wear. The shoulder and the button on the end of the rod should be examined carefully before application to the compressor.

With cross-compound compressors, the large piston bushing, the small cover bushing and the new-style piston valve bushings should be renewed if worn more than $\frac{1}{32}$ in. larger than standarl. Care should be taken to see that the small cover bushing is aligned in the other bushing. After putting the main valve in the long bushing, the small cap should be applied, putting the valve in the bushing before applying the small cap. When new bushings are applied, or if old ones contain enough stock, reamers equipped with guides should be put through them to insure correct alignment.

Reversing valves should be scrapped when the distance between the reversing rod groove and the valve seat is ⅛ in. less than standard. Reversing valve bushings should be carefully examined and renewed if necessary, using faced and repair-size valves when necessary.

The combined wear of the reversing valve face and its bushing seat should not exceed ⅛ in. If combined wear exceeds this, the next repair size of valve should be used. Reversing valve rod bushings should be renewed when they are .008 in. loose on a new rod, and the reversing valve rod chamber cap renewed if worn $\frac{1}{64}$ in. below standard. When the reversing valve of an 8½-in. cross-compound compressor is worn so that the exhaust cavity is less than $\frac{7}{32}$ in. deep, it should be renewed.

When applying steam heads, tighten all nuts around lightly, then those around the steam ports. All nuts should then be tightened after the pump is on the test rack and hot.

QUESTIONS AND ANSWERS

The question and answer department is included for the benefit of those who may desire assistance on problems involving matters pertaining to the operation or maintenance of air brakes, Diesel-electric locomotives, steam locomotive boilers or steam locomotive practice. Any inquiry should bear the name and address of the writer, whose identity will not be disclosed unless special permission is given to do so. Anonymous communications will not be considered. Inquiries addressed to this publication will be referred to the source from which an authoritative answer can be secured.

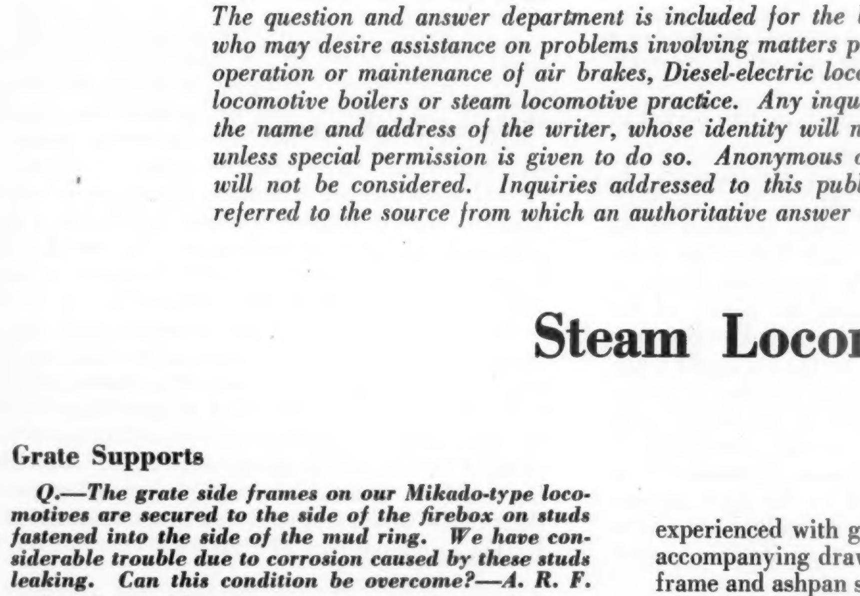
Steam Locomotive Boilers

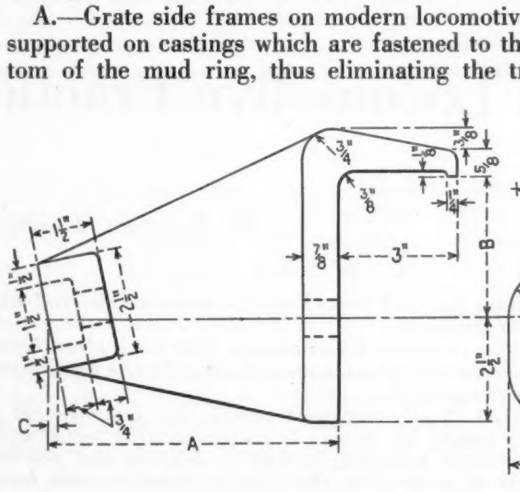
By George M. Davies

Grate Supports

Q.—The grate side frames on our Mikado-type locomotives are secured to the side of the firebox on studs fastened into the side of the mud ring. We have considerable trouble due to corrosion caused by these studs leaking. Can this condition be overcome?—A. R. F.

A.—Grate side frames on modern locomotives are supported on castings which are fastened to the bottom of the mud ring, thus eliminating the trouble experienced with grate side frame studs leaking. The accompanying drawing illustrates a typical grate side frame and ashpan support. The dimensions *A, B* and *C* may be varied to suit individual conditions. This type of side frame support permits the easy removal of the grate side frame for inspection of the firebox side sheets. A similar design can be adapted to any locomotive having sufficient space between the bottom of the firebox ring and the ash pan.





Design of grate side-frame support

Smokebox Netting

Q.—What is the purpose of the netting in the smokebox other than a means of deflecting the sparks; does it have any part in the drafting of the locomotive?—R. I. N.

A.—The only necessity for the netting is to prevent live cinders from going out of the stack. The area through the netting should exceed the combined tube and flue area, or the flow of gases will be restricted with a consequent drop in temperature. A leaking blower pipe, or loose front door, can easily start the

cinders plugging the netting affecting the gas flow. Various arrangements of front ends have been used which eliminate the use of netting by providing a means for burning the coal without spark emission and extinguishing the sparks before they are discharged from the stack.

Back Head Brace Rods

Q.—In computing the number and size of brace rods required to support the backhead of a locomotive boiler can the tee irons riveted to the backhead for the brace rod connections be considered as supporting the backhead?—F.E.K.

A.—While the tee iron riveted to the backhead adds to the strengthening of the backhead, no consideration is given in computing the number and size of the braces required to support the backhead. The general practice is to compute the area to be stayed by taking a line one inch below the point from which the radius of the backhead flange is stuck and also two inches from the center of the nearest row of staybolts. The area thus enclosed is considered as being supported by the backhead longitudinal braces. The load on the total number of braces is equal to this area multiplied by the boiler pressure. The braces should be as evenly distributed as possible and the load on each brace is considered as equal to the total load divided by the total number of braces. If it is felt that any individual brace is so segregated as to receive more than its fair proportion of the load, it shall be investigated separately as to the area it supports. The maximum allowable stress per inch of net cross-section area of round, rectangular or gusset braces shall be 9,000 lb.

Circular Rule for Laying Out

Q.—I have had several requests for a circular rule, used in laying out work, which I am unable to procure in local supply houses. Can you tell me where these rules can be purchased?—E.B.A.

A.—Circular rules or measuring wheels are not listed in the catalogs of the leading tool and instrument manufacturers; however, a sketch or drawing showing the diameter and the graduations required submitted to any of the manufacturers should be sufficient to have same made on order.

A circular rule of measuring wheel can be readily made, using a thin piece of metal, bevelled to a sharp edge and having a circumference of a certain exact length, as two or three feet with divisions in inches and fractions of an inch marked upon it.

The wheel is pivoted to a handle and can be checked by running same over a line the length of which is thus measured exactly. If a graduated wheel is not required, a blank wheel of any diameter may be used after comparing its circumference with a straight line on which the distance to be laid off has been marked, noting the number of complete revolutions of the wheel, and placing a mark upon the wheel for the fractional part of a turn left over.

Steam Locomotive Practice

By George M. Davies

Welding Truck Equalizers

Q.—Is it permissible to repair wrought iron engine truck equalizers with electric-arc welding- The equalizers are the conventional four-wheel engine truck equalizers resting on top of the engine truck boxes at each end.—F.E.F.

A.—Broken or cracked engine truck equalizers should not be repaired by welding. The use of electric-arc welding for repairing these equalizers should be limited to building up the worn ends of the equalizer, where they have become worn from contact with the truck box, with the amount of wear limited so that the equalizer clearances are maintained at all times.

Factor of Adhesion

Q.—Referring to the question and answer in the March issue on the subject of factor of adhesion, I believe what Mr. Davies really had in mind in the concluding paragraph, was that with a greasy or moist rail it is necessary to use a higher adhesion factor to determine the maximum effective tractive force. This would be true, but for the following reasons the preceding statements may be misunderstood or misinterpreted:

As the rail head surface becomes impaired through grease, moisture or other reasons, the effective adhesion factor for a given condition of wheel load becomes less and conversely increases as the rail condition improves.

For example, let us assume that for a given locomotive, the weight on drivers divided by the rated tractive force equals 4:

(a) If all conditions remain the same except that the weight on drivers is increased, this factor will be increased accordingly, but if slipping did not occur with a factor of 4, the effective rated tractive force is not increased.

(b) On the other hand, if the weight on drivers is reduced, the effective factor as well as the rated tractive force, will be lessened.

For (a) sanding the rail would increase the effective factor of adhesion, but the rated tractive force would remain the same unless the boiler pressure was increased or some other related change was made.

For light weight braking ratios of freight cars we have always felt justified in using a higher value with rolled steel wheels than with chilled iron wheels because with the same brake shoes the coefficient of friction with the former is less than with the latter. For example, with rolled steel wheels we might go to 75 per cent of light weight, whereas with chilled iron wheels to avoid the possibility of sliding, the corresponding maximum figure (using these two values simply as example) would be reduced to about 70.

For locomotives we have recognized that with a given weight on drivers a higher normal factor of adhesion is necessary with reciprocating steam (because of crank effect) locomotives than with the constant torque straight electric locomotive, actually to make available a given maximum rated tractive force. Stated otherwise, the straight electric with a given weight on drivers is effective at a lower factor of adhesion than reciprocating steam and consequently, actually will produce a higher rated tractive force.—C.E.E.

A.—The interpretation given to the question in the March Issue was that the writer had indicated the factor of adhesion was accepted as being the weight on drivers divided by the tractive force and was questioning under what conditions a factor of adhesion of 4 could become 5 or 6.

The rated factor of adhesion of 4 is dependent upon and affected by the limiting factor of the frictional resistance or adhesion at the rail. In the case of a greasy, moist rail the factor would become 6.66, which in turn would reduce the amount of the weight on drivers that could be utilized as tractive force from 25 per cent to 15 per cent rather than reducing the tractive force from 25 per cent to 15 per cent of the weight on drivers as stated in the March Issue.

Schedule 24RL Air Brakes

Release and Recharge after Service Application

Q-819—Is this quick recharge of auxiliary reservoir pressure obtained with the graduated release cap in graduated release position? A.—Yes, (until interlock piston moves down at about 6 lb. displacement reservoir pressure), from the emergency reservoir pipe *2* to choke *R*, passage *2a*, cavity *Z*, of the release interlock slide valve and passage *22* to the release slide valve chamber *D*, which is always connected to the auxiliary reservoir by passage *5*.

Q-820—Is the auxiliary reservoir being charged from any other source than the emergency reservoir? A.—Brake pipe air is flowing to chamber *C* as in release position described previously, and charging charge over cock *157*.

Release Insuring

Q-821—How does the release insuring feature function? A.—To positively release the brakes in the event that excessive friction prevents prompt movement of the service piston and slide valve to release position after brake pipe pressure has built up in excess of 2 lb. over auxiliary reservoir pressure.

Q-822—How does this part operate? A.—Referring to Plates A, B, and M, this function is provided by a release insuring valve *150* which is shown *open* on Plate A. Chamber *F* on one face of diaphragm *146* of this valve is connected to brake pipe air through passage *la*, and chamber *M* on the other face of the diaphragm is connected to auxiliary reservoir air through passage 5 and a choke. As long as brake pipe air does not substantially exceed auxiliary reservoir pressure, spring *151* keeps valve *150* closed, cutting off connection between chamber *M* and passage *7*, which as shown on Plate B, registers with slide valve exhaust cavity *A*.

Q-823—What takes place if the slide valve or piston shows excessive friction? A.—Should the parts fail to move to release position when the brake pipe pressure exceeds that of the auxiliary reservoir by more than 2 lb., the greater brake pipe pressure in chamber *F* overcomes the release insuring spring *151*, deflects diaphragm *146* and unseats valve *150*, Plate *A*, connecting auxiliary reservoir air from chamber *M* to passage *7*, thence to the exhaust cavity *A*. This reduces the auxiliary reservoir pressure until brake pipe pressure has obtained a sufficient excess to move the service piston to release position.

Graduated Release Lap

Q-824—When is the graduated release function cut in? A.—When the graduated release cap *12* is in graduated release position.

Q-825—What is the purpose of this position? A.—To reduce the brake cylinder pressure in steps, that is, to graduate it off. To do this the automatic brake valve handle must be returned to lap position before the brake pipe pressure has been fully restored.

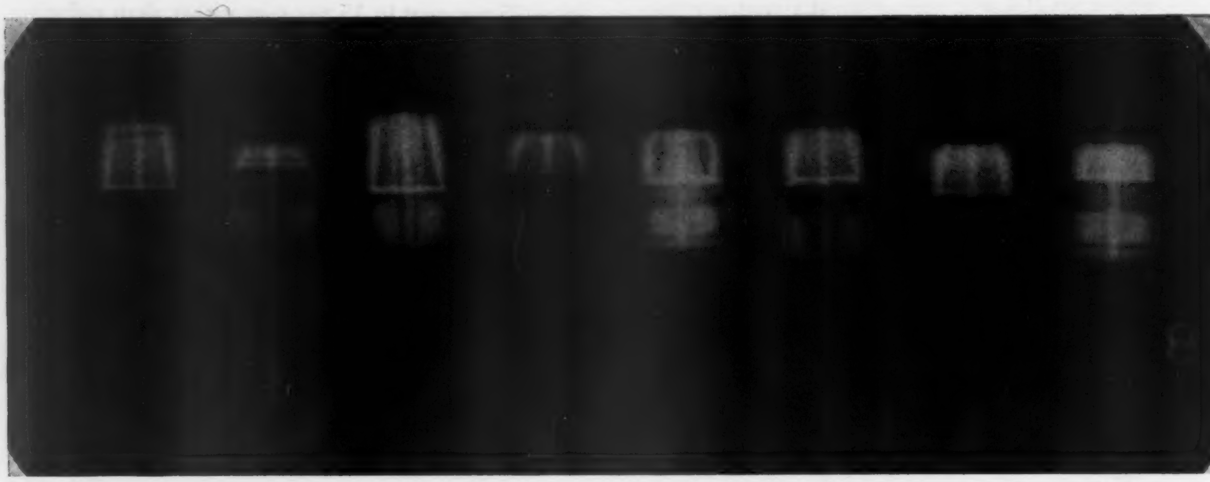
Q-826—What will happen if the brake pipe is fully restored? A.—The brake will release entirely.

Q-827—How is this operation initiated? A.—After the brake pipe pressure has been increased by the initial release so that the service piston and slide valve return to release position, (Plate A) a port in the graduating valve registers with port *E* in the slide valve and seat port *13*. Auxiliary air then flows to chamber *K* on the spring side of release piston *110*, the air now being balanced on each side of this piston.

Q-828—With the pressures balanced, what happens? A.—Release piston and slide valve are returned to release piston by spring *120*, allowing displacement reservoir air to flow to atmosphere through passages *3, 3a* through the cavity in release slide valve and exhaust passage *10*.

Q-829—At this time how do the brake pipe and auxiliary reservoir pressures compare? A.—Brake pipe pressure in chamber *A* on the face of the service piston does not increase after the brake valve handle is lapped, but auxiliary reservoir pressure is increasing owing to air flowing from the emergency reservoir through passage *2*, choke *R*, passage *2a*, cavity *Z* in the release interlock slide valve *137*, passage *22* and release slide valve chamber *D* and thence through passage *5*.

ELECTRICAL SECTION



Radiograph showing construction of different spark plugs

Railroad X-Ray Laboratory

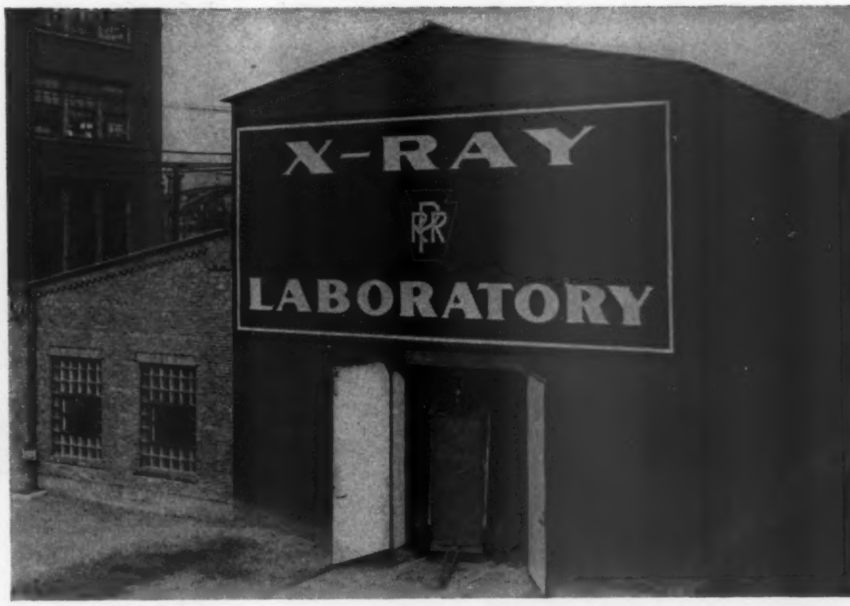
Pennsylvania's installation at Altoona has proved its value in reducing costs and promoting safety by "quality control"

In the maintenance of railway systems, safety leads all other factors in importance, and the X-ray plays a vital role in insuring that safety. The experience of the Pennsylvania, in its Altoona, Pa., Test Department, located adjacent to its large manufacturing and maintenance shops, using a mobile truck-mounted G.E. 250,000-volt X-ray machine over the past 22 months, is proving this fact to managerial, research and shop personnel alike.

In July 1947, with a view to eventual purchase of a 1,000,000- or 2,000,000-volt X-ray apparatus, the company built a concrete structure with walls 18 in. thick. Until such time as this unit is obtained, the 250,000-volt unit is being used to explore all of the many possible applications for X-ray in a railroad shop. Although presently housed in the large concrete building, it can be moved into the various shops for on-the-spot radiography. A special building is not necessary for its use, since distance affords adequate protection from units of this voltage. That this is sufficient can be proven by checking with a Victoreen pocket minometer, a radiation-counting device.

Plans for the acquisition of the higher voltage machine were motivated by the fact that thicknesses of steel in excess of three inches are common in railway equipment, and the exploratory work on smaller parts with the 250,000-volt unit indicates that X-ray can be a great aid in the production of quality control of larger structures, as well.

The 250,000-volt X-ray machine used by the railroad is extremely mobile not only because it is mounted on a four-wheel chassis but also because the X-ray head can be easily manipulated on a jib-crane. The control panel is mounted at the rear in a lead-lined cab with sufficient room for the radiographer during the exposure. Overhead clearance required by the machine is 12 ft. 6 in. When the unit is used in the shop, it is necessary to clear an area within



View showing the exterior of X-ray laboratory and the 250,000-volt mobile X-ray unit

a 75-ft. radius for X-ray protection purposes. Where this is impossible, the uncleared area may be protected by means of portable lead partitions.

An ideal darkroom is maintained by the railroad for use in radiography. It incorporates thermally-insulated tanks in which developing proceeds by the standard time-temperature method. When tap water is above the developing temperature, a thermostatically-regulated cooler brings it down. Unexposed film is kept in cabinets, with a switch arranged to turn off the darkroom lights when the cabinet doors are opened.

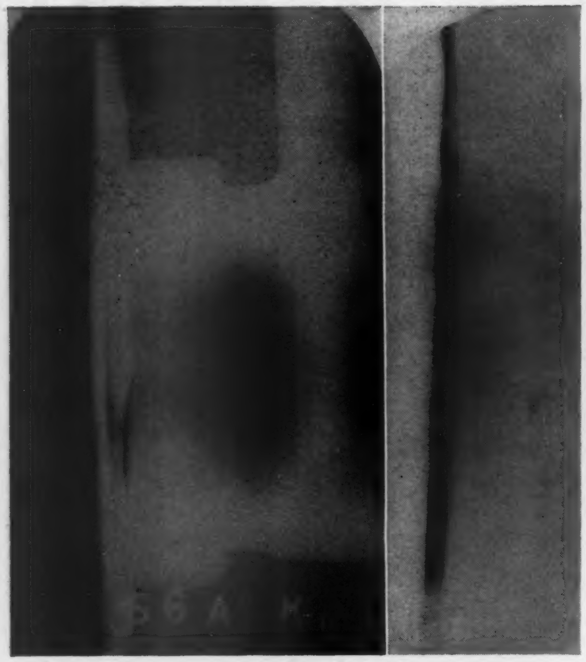
X-ray is used by the Pennsylvania for three purposes: (1) To guide manufacture of both new and replacement parts of railway equipment; (2) For occasional inspection of used parts whose condition is questioned; and (3) As an aid to the Purchasing Department in determining the quality of products it is proposed to buy.

The advantage of non-destructive testing methods over sectioning is particularly pronounced in the railroad field, where large structures are common. Not only is sectioning destructive of what might be a perfectly good casting, but it is also time-consuming, and many times does not give as complete information. Production runs are rare, and X-ray is used primarily as a tool of quality control rather than for routine inspection.

The X-ray unit is operated as a function of the Maintenance of Equipment Department, often re-

X-raying compression member of freight car side frame

Placing film in preparation for X-raying coupler shank



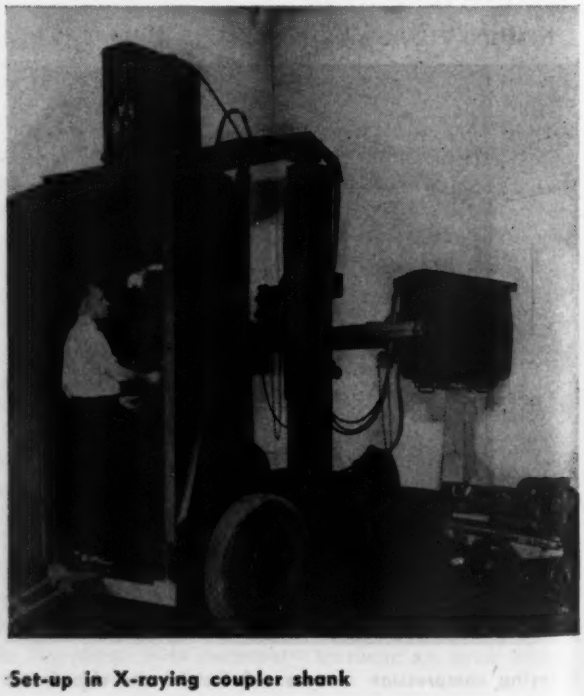
Radiograph of worn threaded area of injector part built up by brazing

A ⅝-in. thick boiler weld—Radiograph shows slight slag

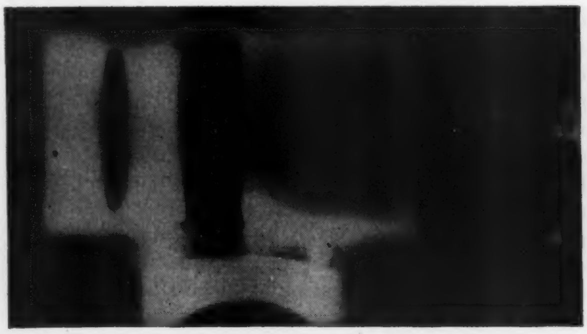
Viewing radiographs

ferred to as the Motive Power Department, under the direction of H. T. Cover, chief of motive power, Philadelphia, Pa.; M. A. Pinney, engineer of tests, Altoona, Pa.; L. M. Morris, assistant engineer of tests; C. H. Dick, lead inspector, and N. L. Klobetanz, X-ray operator. This department is a division of the Operating Department, along with the Maintenance of Way and Structures Department and the Transportation Department. From the names of these organizations, their division of function is apparent. However, the use of X-ray is not confined solely to the Maintenance of Equipment Department. This department is sometimes called upon by other departments to provide service. For example, it performs investigations of failures of rails for the Maintenance

Freight-car side frame set up for X-raying



Set-up in X-raying coupler shank



A 1½-in. cast steel union angle valve showing small blowhole

Steel 2 in. thick, electrically butt welded—Radiograph shows lack of fusion and penetration

of Way and Structures Department, and does other test and research work for the entire railway system.

One full-time man has been found to provide an adequate "staff" so far in the operation of the X-ray apparatus. His salary, the minor cost of films and chemicals, and the original cost of the machine and building represent the company's total investment, initial and current.

Two of the primary factors which motivated the decision to use X-ray were the successful precedent of governmental application and the necessity for using X-ray in guiding the growing trend toward use of welded structures, particularly boilers.

The role played by X-ray on the Pennsylvania can best be understood through the study of examples and case histories.

Case Histories

The bronze catenary clip is a small, but strategic item used as part of the suspension of trolley wires in the electrified railway lines. The clip must be free of all flaws because it carries a load and is squeezed to insure a positive grip. X-ray radiographs showing up flaws clearly and unmistakably, guided an improved production process, and made it unnecessary to depend on luck, guess-work or destructive testing methods.

When the manufacturing shop wanted to compare the results from using split steel molds with those from using sand molds, X-ray was employed to check for homogeneity in the material and freedom from flaws in the pilot castings. Should this study progress as planned, it may make possible the use of molding methods that are substantially less expensive, yet just as effective from the standpoint of safety and serviceability.

The foundry generally casts physical test specimens, which are subjected to a variety of tests for tensile strength, elongation, ductility, etc. Since a casting factor such as faulty gating might cause porosity, it is important to use X-ray as a "screening" measure, thus saving countless expensive hours in the test department on worthless or doubtful specimens.

A reclaimed locomotive injector part was one of the first products X-rayed by the Pennsylvania. It was considered desirable to insure the solidity of that portion of the part which was to be re-threaded. The worn threaded area is brazed before the re-threading job is done. Solid, clean, homogeneous material is essential in this strategic area, for otherwise the casting would leak. X-raying, which was done before the machining operation, thus not only insured the safety factor originally designed into this part, but also saved valuable machining time, which might otherwise have been wasted.

One of the most important applications for X-ray for the Pennsylvania—and for other firms using X-ray—is an aid in the periodic qualification of welders. While X-ray itself is not the determining factor in this qualifying procedure, it can be used as a screening and confirming method to determine the level and type of work done by the welder. The X-ray appearance of a weld will show immediately—before resorting to time-consuming tests—whether or not the weld is satisfactory and will hold up under tests.

Equalizer bars, made of a high grade steel, are used in passenger car trucks to transfer the load from the car to the wheels. Welding repairs on these bars were X-ray inspected to insure that the welding technique set up for reclamation is sound, judging by results on the pilot lot.

Construction of rotary steel buffing wheel

Steel 2 in. thick, electrically butt welded—Good weld

Some of the equalizer bars X-rayed at first showed voids and check cracks, indicating improper preheating of the base metal and unsatisfactory cooling of the weld metal after welding. By combining magnetic particle and radiographic studies the source of the difficulty was corrected.

Freight car truck side frame castings are an important subject for X-ray, particularly in the comparatively thin tension members which carry the main load. The Pennsylvania uses X-ray here to do control inspection on pilot lots. Errors in casting technique are indicated by the location and nature of the flaws revealed by radiography.

Chain links provide another problem for radiography. Only one in. in diameter, they are difficult to examine without the use of copper blocking. X-ray is used to check on the soundness of gas and electric welds and to compare the effectiveness of the two types of welds.

In locomotive boiler welding, or in the welding of pressure vessels in general, the entire weld is radiographed to insure 100 per cent good welds, in accordance with the A.S.M.E. code.

Checking on vendors is a major function of X-ray. In one case, the railroad was considering the purchase of steel rotary buffing wheels from different manufacturers. X-ray revealed the manner in which the wires were fastened to the core and indicated which wheel would be more likely to stand up under extensive use. Safety for the operator was a more important consideration here than the durability of the wheel.

X-ray showed up porosity and cavitation in the body of a one and one-half inch union angle valve made of cast steel. The small pilot lot was completely X-rayed after this condition was found, and the casting technique changed to eliminate the condition.

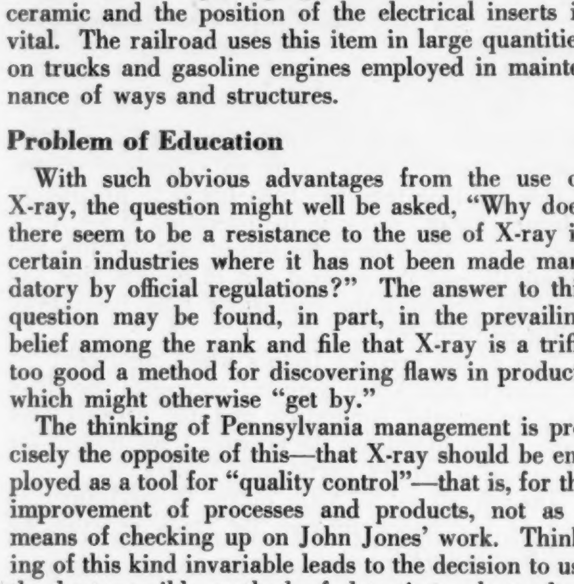
Lack of fusion and penetration in the case of welds is illustrated in some pieces that are electrically butt-welded. X-ray evidence demonstrates several facts about welding: (1) Welders' ability to weld varies with time, the type of product being welded, the type of welding being done, the welding process used, with the condition of the weld metal and parent metal, and with the self-application of the welder to his work on a given day; and (2) Welding of new items often presents new problems that could not be anticipated in advance. Since welding is widely used by the Pennsylvania in repair and replacement, a method for insuring the soundness of welds with positive, visual evidence is indispensable. Mechanical pencils, spark plugs, and other similar assemblies are some of the diverse items which the radiographer checks for the benefit of the purchasing department. Wherever large quantity buying is done, it is important to know the product thoroughly before committing the organization to large sums of money. In the case of spark plugs, the soundness of the ceramic and the position of the electrical inserts is vital. The railroad uses this item in large quantities on trucks and gasoline engines employed in maintenance of ways and structures.

Problem of Education

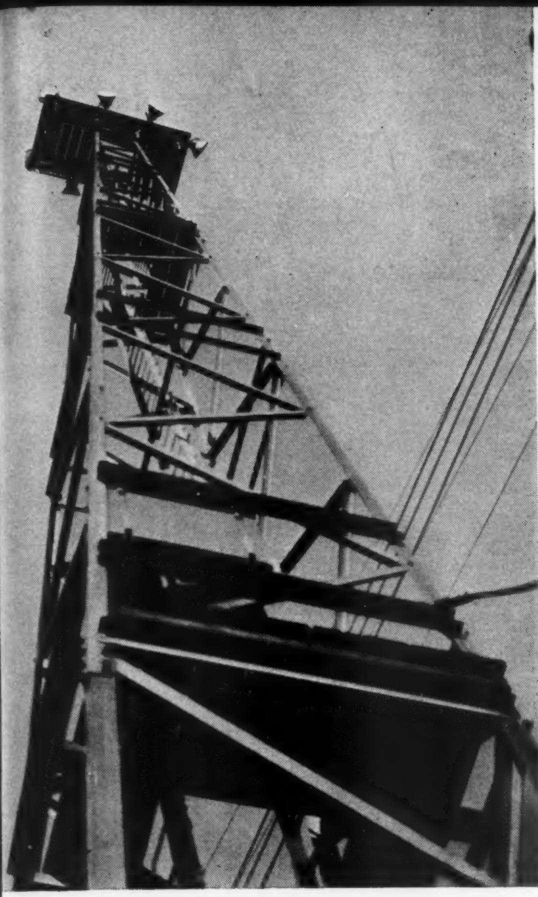
With such obvious advantages from the use of X-ray, the question might well be asked, "Why does there seem to be a resistance to the use of X-ray in certain industries where it has not been made mandatory by official regulations?" The answer to this question may be found, in part, in the prevailing belief among the rank and file that X-ray is a trifle too good a method for discovering flaws in products which might otherwise "get by."

The thinking of Pennsylvania management is precisely the opposite of this—that X-ray should be employed as a tool for "quality control"—that is, for the improvement of processes and products, not as a means of checking up on John Jones' work. Thinking of this kind invariable leads to the decision to use the best possible method of detecting sub-standard work.

* * *



One of the two jeep-hauled, trailer-mounted, engine-driven welders which were used to repair corroded high-tension line poles located along seven miles of rough terrain on the New York, New Haven & Hartford's trunk line between Stamford and New Canaan, Conn.



Worm's-eye view of one of the towers

LIGHTING
A Terminal Yard

Lackawanna photo-electrically-controlled installation materially improves working conditions in yard at Hoboken, N. J.

Cabinet on the lower platform of one of the towers which contains the magnetic switch, the photo-cell relay and a manually operated circuit breaker

A FLOODLIGHTING installation in the Hoboken, N. J., yards of the Delaware, Lackawanna & Western, proved effective in improving working conditions. It is now neither dangerous nor difficult to walk in the lighted area of the yard. Locomotive operators can see to perform all of their duties without the aid of headlights.

The primary function of the yard is to load and unload cars from car floats. It also serves piers, coal docks and warehouses. Car floats are loaded over bridges which are hinged at the shore end, and supported on floats at the water end. The portion of the yard which is lighted is that which is included within the dotted line in the diagram.

The lighting units are located on one old tower and seven new ones. The new towers are standard towers supplied by the American Bridge Company. They are made of galvanized angles and no guys are required. Nine piles under each tower support the reinforced concrete footing. The towers are 100 ft. high, and have 8-ft. by 2½-ft. platforms with railings for protection of the men who replace lamps and clean the front glass of the lighting units. There is room on each platform for 12 lights, the number actually installed on each tower is shown in the diagram. The platform is reached by means of three ladders, with a landing or platform between the first and second, and the second and third ladders.

Lighting Units

The lighting units on the platforms are General Electric 1,500-watt, type L-69, Sports Floodlights. They are fitted with general service lamps, and are

The yard as seen from the east end looking west showing five of the new towers

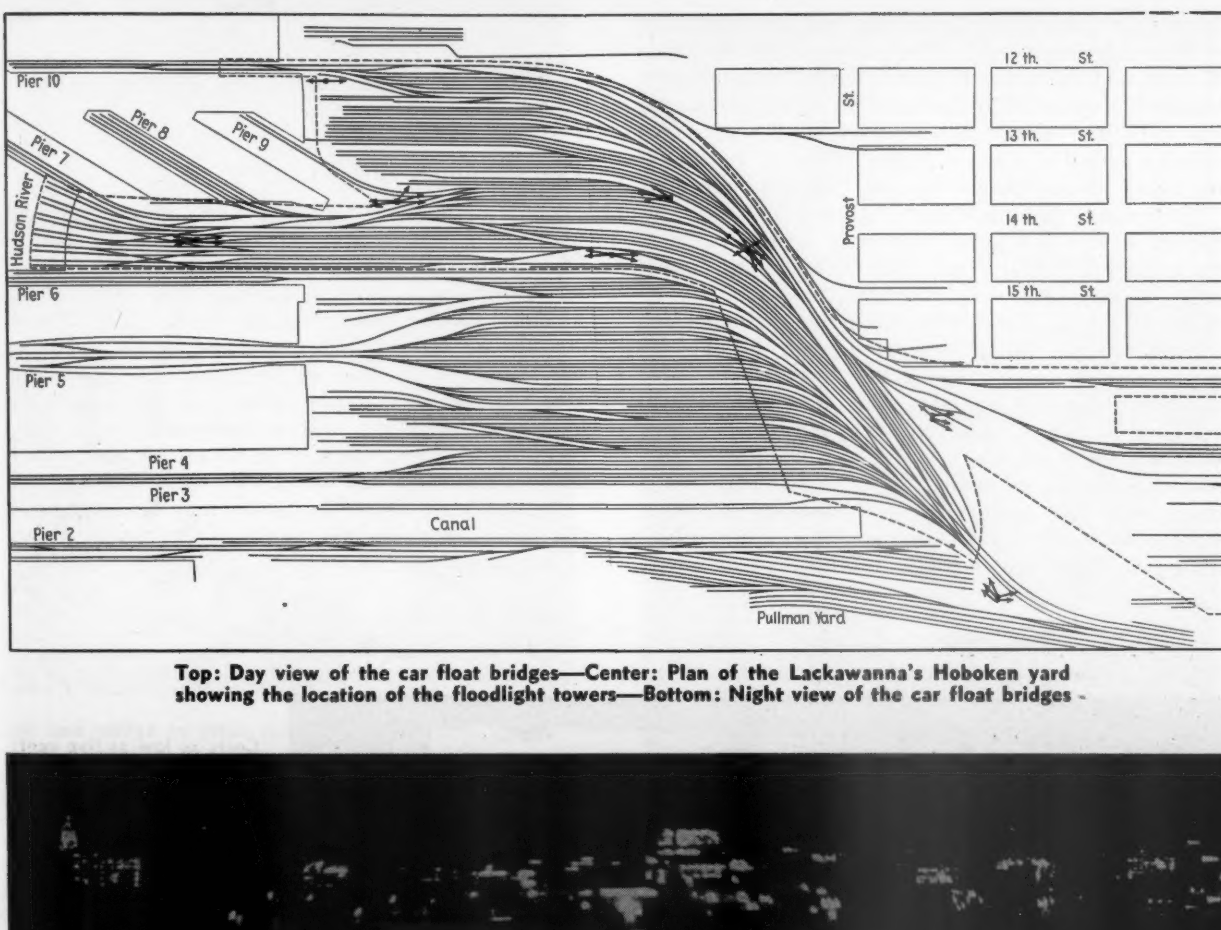
designed for the lighting of long narrow areas. They are light in weight,—the floodlight, complete with lamp weighing only 19 lb. The Tufflex tempered plate glass cover is spun-sealed to exclude water, dirt and insects. The reflector is made of Alzak processed aluminum.

The socket housing is an aluminum die casting secured to the reflector housing with clamps and gasketed to exclude dirt and moisture. The opening made by removing the socket housing is sufficient to permit its reapplication with the lamp in place, thus eliminating the need of a removable or hinged front door. No focusing is required when lamps are replaced.

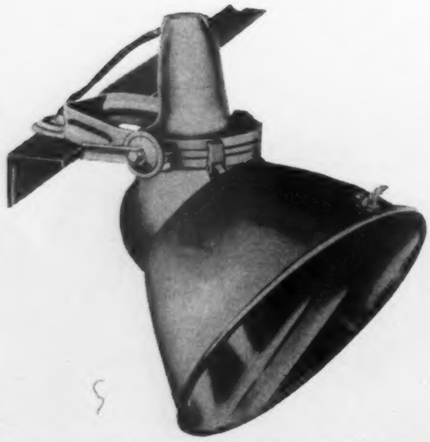
The galvanized, malleable iron base used to mount the unit on the tower is attached to the unit by a trunnion bracket which allows the unit to be swung up, if necessary, for cleaning. No tools are required, and when the reflector is swung back, it returns to its original position. For lateral aiming, there is a V-notch rear sight in the top of the socket housing and a blade front sight on the upper rim of the reflector housing. For the original vertical adjustment, there is a degree scale on the mounting trunnion which permits daytime adjustment from aiming charts. For lighting the area immediately under the tower, some of the towers are fitted with a wide spread, sealed-beam 300-watt lamp, pointed directly downward and mounted at a height of 80 ft.

The circuit breakers which control the lighting

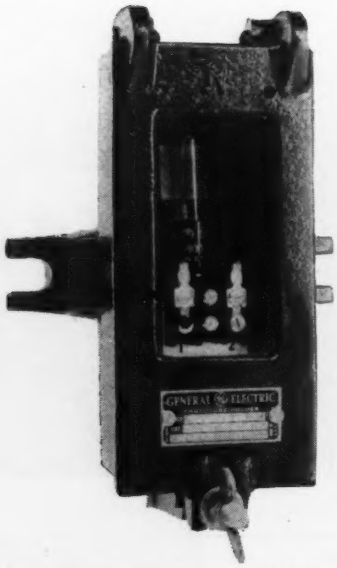
Night view from the center of the yard looking east



Top: Day view of the car float bridges—Center: Plan of the Lackawanna's Hoboken yard showing the location of the floodlight towers—Bottom: Night view of the car float bridges



One of the G.E. type L-69 Sports floodlights



The phototube in its enclosure which is mounted on the side of the control cabinet facing north

circuits on each tower are controlled automatically by photo-electric relays. The relays are set by trial to open and close the circuit breakers with an appropriate degree of darkness. As daylight passes into dark, the circuit breakers on all towers close within a period of a few minutes. None of the lights has gone into service during dark daylight hours.

The control equipment is all located in a wooden cabinet on the first tower platform. In this cabinet are a General Electric, type CR7006 magnetic switch with thermal overload protection, operated by a photo-cell relay. The phototube itself is mounted in a metal housing with a glass window on the outside of the wooden cabinet facing the north where it is unaffected by direct sunlight. The phototube, which is a Type G. E. L-930, operates a Type CR7505-H109 relay, and the relay in turn opens and closes the magnetic switch. An adjusting knob in the relay case, which may be operated by a screwdriver without opening the cover, controls the response of the relay to varying degrees of daylight brightness.

Power Supply and Wiring

Some of the lighting towers are fed underground with 440-volt, 3-phase, 60-cycle power carried in Okosheath cable buried directly in the ground. The service is carried to a 440-110 volt transformer mounted on the tower near the base. The 120-volt circuits are carried to the magnetic switch and from the switch to the top of the tower in Type ASE armored service entrance cable. At the top of the tower each lighting unit is protected by a Pyle-National, 20-amp., single pole circuit breaker with a thermal trip, in a cast-metal, rain-tight housing.

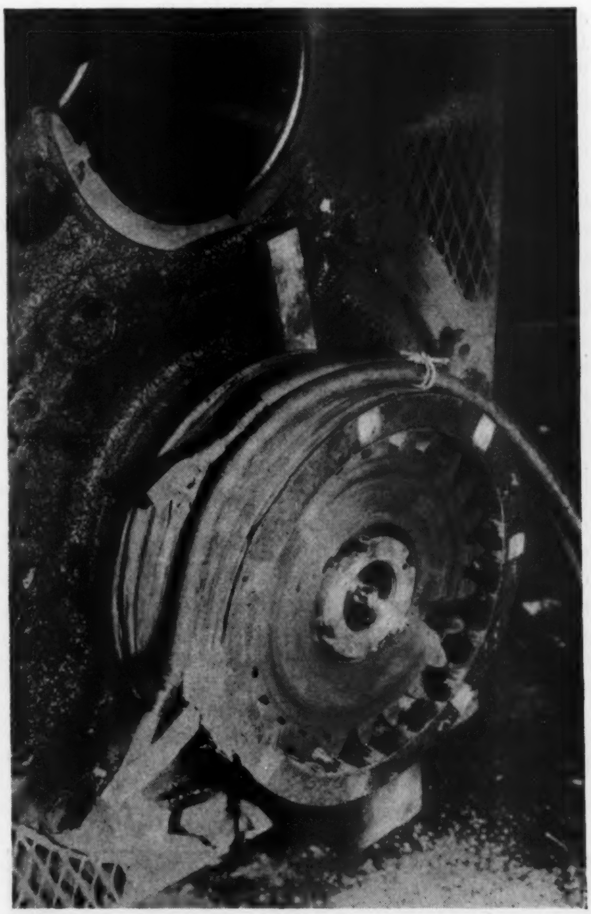
In locations, where the power may be brought to the towers aerially, the source is 2,400-volt, three-phase power.

* * *

Costs as low as five cents per point-per-hour of heavy snow were recorded by the New York Central for the electric heating of switch points during the winter of 1948-49—The General Electric heaters used consist of a calrod heater with a sealed terminal housing at each end and a rubber-covered cable lead—The closing of an electric switch at the approach of a storm is the only manual operation required—Cars being moved over a switch which has been cleared of snow by electric snow melters

Removing Pinions By Induction Heating

A means of removing traction motor pinions which is fast and easy and which will not damage pinion, shaft, or pinion nut thread, is now in use in the Moncrief Shops of the Atlantic Coast Line at Jacksonville, Fla. It consists of placing an electric coil or solenoid around the pinion, passing current through the coil which heats and expands the pinion, while a light wedge is driven between the motor housing and the pinion to exert a force tending to push the pinion off. The time consumed in removing the pinion is 4½ minutes.



Coil and wedge in place ready for removal of pinion—Pinion nut has been backed off to allow for releasing pinion without letting it fall to floor

Heating Coil

The heating coil consists of 85 turns of two No. 6 glass-insulated magnet wires connected in parallel. The coil is wound on a ring made of glass-base Melamine supplied by the National Electric Coil Company. Insulation between coil layers consists of asbestos tape, impregnated with silicone varnish. The current used is 345 amp., at 440 volts, single-phase, 60-cycles. For a 25-tooth pinion, the inside diameter of the coil is 12½ inches.

Procedure

To remove a pinion, the pinion nut is first removed and re-applied about two turns on the thread. This is done to prevent the pinion from falling on the floor when it comes off. The coil is then placed over the pinion, and the current turned on. After 2½ minutes, the current is cut off and the heat allowed to soak in toward the center of the pinion. After one minute, the current is re-applied and the pinion can be removed in another minute.

This timing was developed by means of a pyrometer applied to the pinion face. When done in this manner, the temperature of the pinion teeth will not rise above 300 deg. F., and heat will not reach the shaft in sufficient amount to cause it to expand. An automatic timing device has been designed, which

Showing the manner in which a pyrometer is used to determine temperature across the face of the pinion—Current is turned off while readings are taken—Oil vapor may be seen rising from the heated pinion

When the pinion is free, the nut is removed and the pinion taken off

will close and open the circuit automatically to prevent any inaccuracy of procedure.

When the heating coil is first applied, the wedge is driven between the housing and the pinion. Normally a U-shaped wedge is used for this purpose, but a light single wedge as shown in the illustrations is sufficient. When the pinion is ready to come off, the wedge is struck with a hammer. A two-pound hammer is sufficient. Final release is usually effected by a light hammer blow on the face of the pinion.

The method of using this coil was developed by J. C. Foster, electrical department foreman, Moncrief Shops, Atlantic Coast Line, Jacksonville, Fla.

Radio for an Industrial Railroad

Diesel-electric switching locomotives within the General Electric Company's Schenectady Works have been equipped with two-way radio-telephones to speed movement of materials.

An eight-station radio network has been set up to co-ordinate rail movements of about 3,600 loaded cars a month on the 25 miles of intra-plant track. Six Diesel-electric switchers are now in constant contact with the yard office, the foreman's automobile, and each other. Station K2XCF, a 50-watt transmitter, has been set up on the top of a building which is centrally located.

Mobile equipment is installed on the rear wall in the cab of each locomotive, with a speaker, a "push-to-talk" hand set, and controls. All of the sets are tuned to the same frequency so that every loudspeaker reproduces all conversations taking place. This arrangement is expected to bring about a better understanding of the overall switching operation, to eliminate the possibility of "cutting in" on conversations and to enable the yardmaster or foreman to issue general orders, plant officials said.

In the past, orders for having materials moved were phoned into the yard office, and the foreman was required to carry the orders in his car to the appropriate locomotive crews. Because the foreman was necessarily out of the office most of the time, there were delays in executing orders and trouble-shooting was slow. Now, orders can be relayed to the train crews as quickly as they are received and, if difficulties arise, they can be reported to the foreman and cleared up at once.

The locomotives, six G.E. 80-tonners, handle about 3,600 loaded cars a month over 25 miles of track in the 600-acre plant.

Left: Engineer in locomotive cab talks to dispatcher over new eight-station radio-telephone network—Right: Dispatcher at 50-watt transmitting station K2XCF sending orders to locomotives

NEW DEVICES

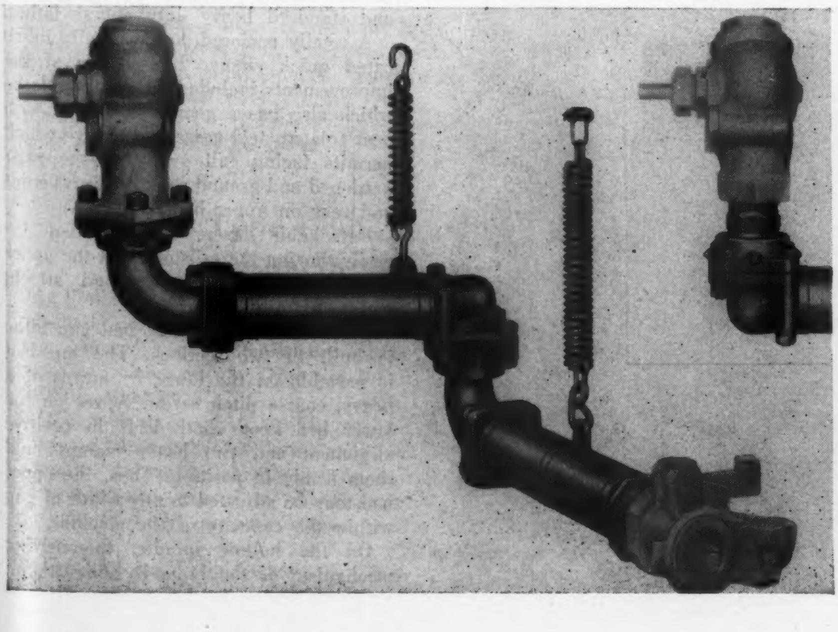
Lighter Steam Heat Connections

The Barco Manufacturing Company, Chicago, has placed on the market a new 2½-in. steam heat connection for passenger cars, Diesel and electric locomotives, which is approximately 30 lb. lighter than previous designs, embodies all-steel welded construction with unrestricted flow, and eliminates heavy castings and all pipe threads in the connection itself. There are only two joints or moving points per connection in place of the usual four, thus minimizing the parts subject to repair and replacement. All wearing parts are hardened-steel chromium-plated.

There are only two wearing gaskets per connection and these are interchangeable on all 2-in. and 2½-in. Barco connections, thus simplifying stock inventory. This is the same type of gasket which is reported to have given reliable service on railroad equipment for many years.

The new Barco steam heat connections are applied and removed from the end valve without dismantling by means of either a threaded or a flanged and bolted joint whichever is preferred. They are designed for simplicity and ease of handling in shops and coach yards. Besides light weight and relatively few parts, an additional feature is exceptional flexibility due to the familiar Barco combination swivel and ball-joint construction which permits movement in every direction. Insulation of the connections is optional. If specified, it is effective and carefully protected by metal covers which assure long life.

Standard dimensions are 18⅝ in. between joint centers and 27½ in. between the center of the lower joint and the face of the coupler head gasket, as recommended by the A.A.R., but these dimensions may be varied to suit individual requirements. The length of the support-spring and the safety-spring arrangements may also be varied as required.



Electrode Holders

Six new electrode holders for the Inert-Arc process, one for machine welding and five for manual welding, have been announced by General Electric's Welding Divisions.

The manual holders are available in 100-, 200-, 400-, and 800-amp. ratings, and the holder for machine welding in ratings of 400 and 800 amps.

The new electrode holders for manual welding are: a 100-amp., air-cooled model with spring-type collets, metal nozzle, and gas-tight, heat-resistant gasket; 200-amp. (shown in the illustration) and 400-amp., water-cooled models with split-copper collets, ceramic nozzles, and gas-tight, heat-resistant gaskets; a 400-amp. model with integral water-cooled metal nozzle, furnished with tips of two orifice diameters; and an 800-amp. model furnished with one electrode assembly for each size listed and with three water-cooled metal nozzles, one for 5/16-in. and ⅜-in. electrodes, one for 7/16-in. electrodes, and one for ½-in. electrodes.

For machine welding the 400-amp., water-cooled electrode holder is furnished with one piece of each size of tungsten and one set of collets for each size. With this holder the electrode may be adjusted while welding, and both the electrode and collets may be changed without removing the nozzle.

The 800-amp., water-cooled holder for machine welding is furnished with one electrode assembly and nozzle for each size of electrode. With this model, too, the electrode extension may be adjusted while welding.

Many Purpose Cylindrical Grinder

This grinder was developed for a variety of operations. It can be used for small manufacturing purposes in large or small shops and tool rooms. For these uses, it has a capacity of 28 in. between centers and will swing 12 in. diameter work. The grinder has been made available by the Landis Tool Co., Waynesboro, Pa.

The grinding wheel base is equipped with a 12 in. diameter grinding wheel powered by a 1 h.p. motor. Self-aligning, babbitt lined, one piece steel bearings

which will absorb thrust load are used to support the wheel spindle. A graduated swivel base permits swiveling the wheel head for unusual grinding set-ups or for truing an angle on the wheel face.

The headstock has a speed range from 85 to 483 r.p.m, by rheostat control. There are only two revolving parts; the motor spindle and the face plate. Either live or dead spindle operations may be used by moving a lever. Vee belt drive is used. The base is mounted on a graduated swivel for setting up angle or face grinding operations.

Power traverse is supplied for the traverse. Four different speeds may be selected from a shift lever on the front of the machine. Two speed hand traverse is standard; the slow for grinding fillets or shoulders, the fast for set-up. For taper grinding, the table may be swiveled. A scale, graduated both in degrees and inches per foot, permits accurate settings.

A reservoir for coolant with settling baffles and a sloping clean-out lip are part of this casting. Other compartments in the bed house the electrical control panel and traverse drive motor.

Both the wheel feed and hand traverse mechanisms are mounted on pre-loaded ball bearings. A full nut with compensation for black-lash is used on the wheel-base. Both coarse and fine-wheel feed are provided.

Rubber Imbedded Rotary Wire Brush

A rotary wire brush with bristles imbedded or locked in rubber centers, has been announced by the Hewitt Rubber Div., Hewitt-Robins, Inc., Buffalo 5, N. Y.

The Rubberlokt brush represents a departure from the conventional types of rigid metal or wooden flange construction. The combination of steel bristles mounted in rubber has produced a far safer brush, one which lasts longer and does a better job.

The Rubberlokt core increases service life and eliminates localization of bristle fatigue by allowing the wire bristles to flex over a gradual arc of their entire length. Thus, the bristles are not prematurely broken and thrown out, keeping the brush in balance. The flexibility of the rubber core enables the wire bristles to return upright after each contact with the brushed surface.

The flexible, upright wires continuously maintain the maximum number of cutting points in contact with the work and the brush face will hold its position and readily conform to uneven surfaces.

The mounting cushions vibration and greatly reduces fatigue to the operator. Less vibration offers greater protection for tool bearings and arbor shafts. Less pressure on the brush results in greater speed as there is no slow-down of the motor. Due to an almost complete retention of wire bristles, the rotary wheel brush reduces the number of flying wire points and offers a safer tool.

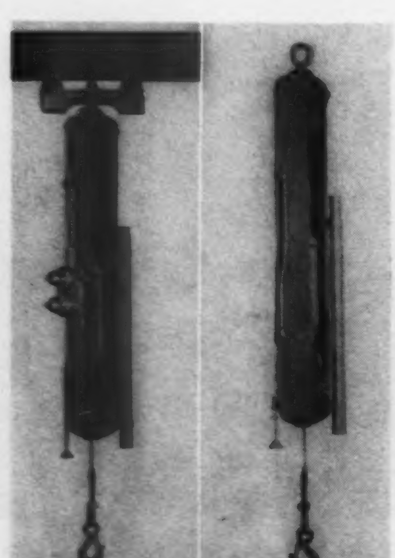
Hewitt is presently producing six, eight and ten-in. industrial sizes. The brush can be used on either bench or portable tools in industries and shops where buffing, roughing or finishing with a wire brush is a part of the operation.

Tool Balancers In Two Models

The illustrated tool balancers represent one of the latest developments by The Platz Co., 20433 Sherwood ave., Detroit 12, Mich., for industrial production efficiency. They are designed to meet exacting requirements of the production line.

The standard tool balancer shown at the right balances a tool left in any position in the balancing range without any up or down creep, and can be moved up or down with the slightest pressure. With the device, the operator is free to preform an operation, whether in an up and down, right and left movement or stationary.

The balancer hangs from a fixed point, or is equipped to operate on a standard 4- or 6-in. I beam. It swivels vertically from zero to 17 deg. and will rotate 360 deg. and is equipped with a conduit tube to support the inlet hydraulic hose, or electric cable to the portable tool being balanced. A safety latch is provided which holds the tool at the top of the balancing range when production line is down or when the air is shut off. This latch is released by a convenient release knob.



The standard unit is available in ranges of 36 and 42 in., for balancing tools that weigh from 10 to 500 lb. and operates on 100 lb. air line pressure. They are built to balance a specific weight plus or minus 2½ lb. to plus or minus 15 lb. on larger models. This tool balancer does not consume any air, it just uses the pressure.

The adjustable weight tool balancer shown at the left, is built for those who are undecided on the type or weight of tool to be used, or who desire to install interchangeable equipment to balance any range of weight. An adjustable pressure valve unit is furnished which allows the adjustability to balance any tool from 10 lb. to a selected maximum weight. Balancers are selected to the nearest standard maximum weight as listed in increments of 25 lb. from 50 to 400 lb. and in 50 lb. increments from 400 to 500.

Sliding Bed Gap Hollow Spindle Lathe

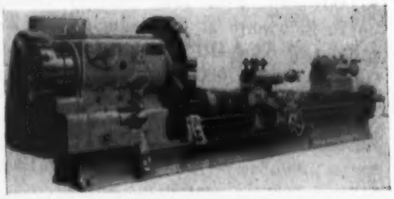
Two LeBlond lathes—the 25/50-in. Sliding Bed Gap and the 27-in. Hollow Spindle—have been combined into one machine with a swing capacity of 60½ in. within a 5-foot-wide fap and a spindle hole of 12½ in. by the R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio. It offers the productive capacity of three lathes: sliding bed gap, hollow spindle, and standard heavy duty engine lathes.

A totally enclosed, automatically lubricated quick change box is one of the improvements included on this new lathe which also has a geared headstock with heat treated steel gears; a carriage which permits facing full swing of the gap; hardened and ground steel bed wavs front and rear on upper bed.

Detachable levers are provided for easily moving the tailstock and the upper bed. Standard accessories and attachments are available.

The bed on the sliding bed gap lathe is built in two sections. The top bed is movable on the lower by means of a heavy, coarse pitch screw. A vee on the lower bed keeps both beds in positive alignment and two heavy clamps hold them firmly in position. Thus, the upper bed may be adjusted to any width of gap within the capacity of the machine.

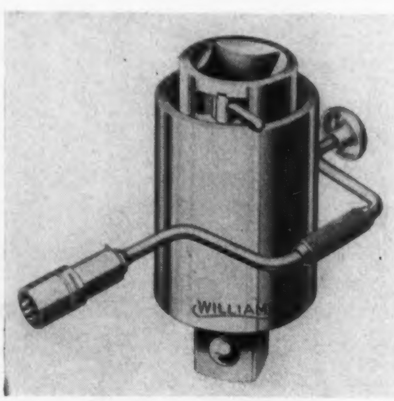
On the hollow spindle, the driving mechanism of the lathe is built around



the spindle hole. The hollow spindle headstock, therefore, represents an important achievement. All other component parts of the hollow spindle lathe are similar in construction and operation to LeBlond's standard heavy duty engine lathes.

Ratchet Adapter

Due to the compact design this new adapter, ratchet action is possible in extremely limited quarters. Its use with any of the ½ in. square drive handles or



attachments such as speeders, T handles, flex handles, etc., increases the versatility of the driver selected by converting it to a ratchet tool.

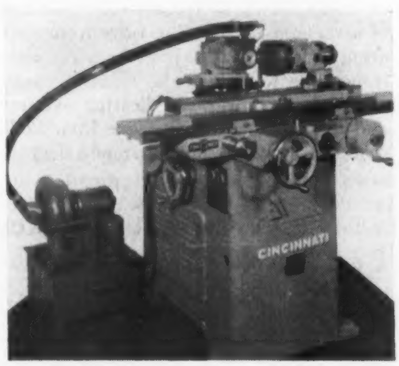
The device, available from J. H. Williams & Co., 400 Vulcan st., Buffalo 7, N. Y., is made from alloy steel and is finished in bright chrome-plate. Length is 2⁹⁄₁₆ in., diameter is 1¼ in. The ratchet-gear has 30 teeth and a shift lever reverses action instantly.

Mist Type Coolant Grinder Attachment

The illustrated attachment offers the dual advantages of wet grinding and dry grinding. Since the only connection with the machine announced by The Cincinnati Milling Machine Co., Cincinnati, Ohio, is the coolant guard, it can be applied to any Cincinnati No. 2 Cutter and Tool Grinder. It can be readily set up and removed when desired to change from carbide to high speed or carbon steel cutters.

The unit consists primarily of a floor unit composed of a coolant tank, pump, and suction fan; a large diameter flexible return tube and a small diameter supply tube to the grinding wheel; and a guard which completely surrounds all but the face of the wheel.

A thin stream of coolant is directed to the wheel. The rapidly rotating wheel transforms the coolant into a fine mist,



but instead of throwing it off on the machine, operator and work, it is immediately returned via the suction tube to the coolant tank. Thus a small amount of coolant continually circulates on a non-stop round trip.

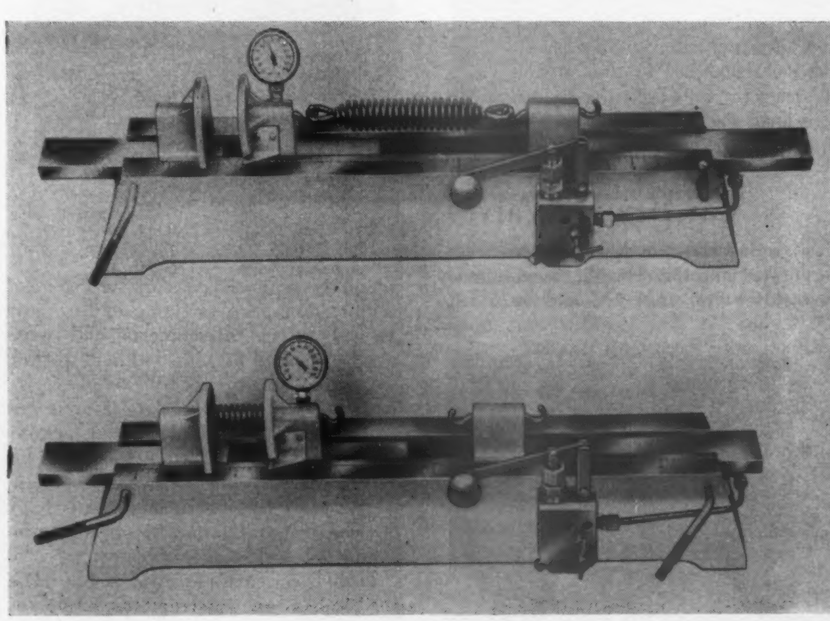
Hydraulic Spring Analizer

An analizer, hydraulically operated, has been placed on the market by Storm-Vulcan, Inc., Dallas, Texas. The unit measures and tests springs not only by comparison but by actual compression or tension rate of each spring. In addition, the instrument checks for standard specifications and performance in automotive and industrial applications.

The device measures the rate of compression springs ½ in. to 6 in. long or tension springs 1 in. to 22 in. long in diameters to 3 in. Rate readings are given in pounds of pressure from 0 to 300.

It is equipped with hydraulic controlled compellor and resistor heads and the instrument base is scaled in inches.

The analizer permits field testing of springs, perfect matching and balancing of springs in sets where positive control of performance is desired.

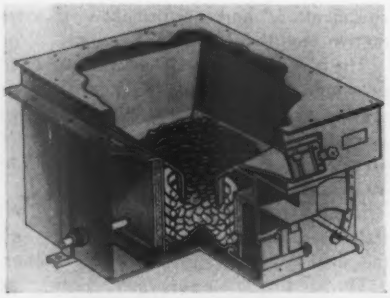


Heating System For Refrigerator Cars

A thermostatically controlled method embodying an underslung automatic-feeding charcoal heater for heating cars carrying perishable products has been developed by Luminator, Inc., 120 North Peoria street, Chicago 80. This is manufactured under license from Robert Mitchell Company, Montreal, Que.

Over 5,000 of these heaters have been in use in Canada since before the war on a manually controlled basis and have given excellent service both on the Canadian National and the Canadian Pacific. Some of the American installations contain a thermostat which eliminates the need for manual control on the road.

The Luminator-Mitchell heater is fired by charcoal which is fed into a magazine of 50 lb. capacity from which it automatically drops by gravity at the proper rate into a burning chamber which is surrounded by a copper coil. The copper coil contains ethylene glycol anti-freeze solution which is warmed and circulated through a piping system over the floor of the car and which returns to



the coil in the burning chamber to be rewarmed. The chimney arrangement and damper controls deliver a balanced air intake and air outlet. The difference between top and bottom temperatures in the car can normally be held within about two degrees.

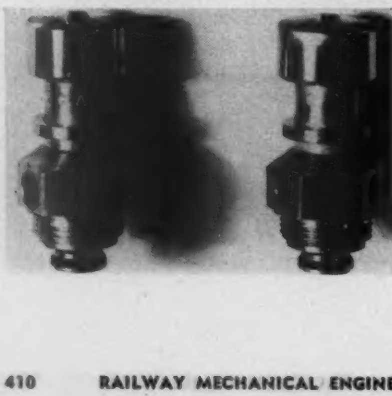
A thermostatic control has been developed for use with the heater. A three-way valve adjacent to the heater is actuated by a bulb located inside the car. When the temperature within the car is below that set on the thermostat, the flow of warm liquid is from the heater through the valve into the car and back to the heater. When car temperature is above that set on thermostat, the warmed liquid flow is from heater through valve through heat exchanger and back to heater.

With this control the thermostat is set for the desired temperature within the car and the heater is lighted and refueled at approximately 24- to 48-hour intervals from the ground outside the car. The inside of the car will remain within about two degrees of the indicated temperature setting. The air within the bunkers remains unchanged.

Aside from the improved servicing conditions which the underbody heater offers as compared with portable bunker heaters, it simplifies conversion from refrigerating to heating service, sometimes required within the limits of a single trip. Instead of the tedious job of chopping out the ice remaining in the bunkers, it is only necessary to light the heater, which will melt the ice and protect the load from freezing.

Car Heating Valves

Two engineering changes have been incorporated into the solenoid steam admission valves No. 1671 CC and 1675 CC manufactured by the Vapor Heating Corporation, Chicago to improve operation and reduce maintenance of these devices. A steam-resistant ring, made of a tough synthetic material, has been added to the lower portion of the stainless steel needle in the needle valve assembly; this ring improves the steam right closing of the valve, making it unnecessary to lap-in.



A ball bearing check valve has also been incorporated into the trap portion of these valves to reduce the possibility of a vacuum keeping the valve from operating properly. These improvements make it possible to reduce the steam pressure in coach and overhead heating systems, and to reduce steam pressure from 12 lb. down to 3 lb. in multiple-room sleepers.

Circuit Breaker

A line of Type DB 600-volt d.c. or 250-volt a.c. circuit breakers with accurate tripping characteristics for low-voltage power distribution in industrial plants, motor starting duty, and similar service is announced by the Westinghouse Electric Corporation. Accurate control for long time delay with protection from tampering is provided by a time-delay element assembled in a hermetically-sealed tube.

The breakers are designed for easy maintenance. Conducting parts are assembled on a moulded insulating base

which is mounted on a metal base for rigidity. Complete shielding of live parts assures safety. Attachments and parts can be removed or added without drilling or moving other parts.

Breakers are available for overcurrent protection with delayed and instantaneous tripping for use on motors and for general purposes, or for overcurrent protection with both long and short delay for proper coordination in selective protection on fault current.

Two frame sizes are available. The DB-15 has an interrupting rating of 15,000 amp. with load current ratings up to 225 amp. at 600 volts a'c' or 250 volts d.c. The DB-25 is rated for load currents up to 600 amp. with an interrupting capacity of 25,000 amp.

Band Saw

This large capacity machine provides the mechanical essentials for high speed economical band sawing of wood or sheet metal. Full consideration is given for the operator's safety and minimum maintenance requirements. The unit, manufactured by The DoAll Co., Des Plaines, Ill., utilizes a narrow hard tooth flexible back buttress blade up to 2 in. width which requires no resharpening or spring temper. For fine work, blades as narrow as ¼ in. may be used which will permit sawing a ⅝ in. radius.

It is sturdy enough to handle all routine work, light enough to be moved and flexible enough to utilize any power form.

The model 36-L saw offers large work capacity in its 36 in. throat and 20 in. maximum thickness capacity. The main

work table is 30 in. by 36 in. with handwheel operated table tilt 45 deg. to right and 5 deg. to left. An auxiliary table is 19 in. by 19 in.

Aircraft type hydraulic brakes on both saw carrier wheels and complete saw blade guarding provide maximum safety for the operator. Saw guides are adjustable insert type and have anti-friction thrust bearings.

The machine includes a large capacity dust spout for exhaust connection, spring tensioned upper wheel, counter balanced saw post and 36 in. rubber tired saw carrier wheels. It can be furnished with either direct or belted drive for single speed sawing or with stepless variable blade speed control over a range of 1,000 to 5.000 or 2,000 to 10,000 ft. per minute making it flexible and adaptable to a wider range of work. Drive motors ranging from 3 to 10 h.p. mav be used to suit the power requirement to the work.

Paint and Air Heater

A paint and air heater has recently been officially listed and approved by Underwriters' Laboratories, Inc. This explosion-proof Model U heater for spraying paints, lacquers and synthetics, is manufactured by Bede Products, Inc., 4311 Ridge road, Cleveland 9, Ohio.

No water or heat transfer liquid is necessary, since aluminum is used as the heat transfer agent between the two 1000-watt cartridge type heaters, paint heating coils, and air heating coils. A layer of glass wool insulation surrounding the heating unit prevents heat loss, and a

sheet steel outer shell provides protection against damage.

Better-quality paint films are attained by heating the paint—lowering its viscosity and enabling the solid content to be increased by reducing the amount of thinner used. The heater comes up to operating temperature within 15 min. Temperature is maintained at pre-set values by a thermostat and thermoswitch. A thermometer records the paint temperature as it leaves the heater. No attention, other than plugging in the unit, which is available for 110 or 220 volt a.c. operation, is required. Capacity is approximately eight gallons per hr. A circulating system, for use with longer paint hoses or for intermittent spraying, is available separately.

Electric-Steam-Vaporizer

A portable, electric-steam-vaporizer that works automatically is offered by the Hydro-Mist Division, of Tempo Industries, Inc., Glendale, Calif., as a thorough and inexpensive means of pest control for railroads.

Hydro-Mist, as the vaporizer is known,

holds 44 oz. of insecticide and dispels the solution under heat and pressure. One filling will treat a minimum of 500,000 cubic feet. Hydro-Mist solution, or an approved insecticide, is safe for all warm blooded animals, yet is sudden death to flies, moths, gnats, mosquitoes, silverfish, roaches, beetles, bed bugs, ants and other similar insects and pests.

The exterminator weighs a little more than 8 lb. and needs only to be filled, plugged into an ordinary electric socket, and the time clock and thermostat set. The remaining operations are automatic.

A.C. Arc Welders

A line of a.c. arc welders, featuring increased welding range and stepless precision current control, has been announced by General Electric's Welding Divisions.

The welders are available in 200-, 300-, 400-, and 500-amp. models for indoor manual welding; 750- and 1,000-amp. models for machine and submerged melt welding; and a special 200-amp. model for light-duty, job-shop welding. The 300-, 400-, and 500-amp. models (the lat-

ter size is shown in the illustration), are offered also in weather-resistant enclosures with Idlematic control for both indoor and outdoor operation.

Dual current ranges and increased adjustment overtravel on the new machines provide extra low current range with high maximum short-time output. They are designed with stepless current control, operated by a bearing-mounted current-adjustment crank which enables the operator to make precision settings through the current range.

The welders have an open-circuit voltage of 75 volts. The controls on the weather-resistant models automatically reduce the open circuit voltage on the electrode to about 30 volts, but when the arc is struck the advantage of 75-volt open-circuit voltage is retained.

Increased strength and protection for the welders are provided by the newly designed steel housings. Built-in power factor correction helps to keep down power consumption, thus lowering operating cost. Cool operation is attained through up-draft, fan-assisted ventilation.

Silver Plating Powder

A method of silver plating high-amperage electrical connections in place has been developed by the Cool-Amp Company, Portland, Oregon. The product is designed to improve continuity of electrical

service and reduce maintenance by preventing heating due to oxidation.

The plating powder deposits a coat of silver that will not peel off and which reduces contact resistance when applied to copper, brass or bronze contacts. It is claimed to be completely harmless to the user and is simple to apply. The only equipment needed is a sharp steel wire brush or abrasive cloth, clean rag and water. A pound of the powder will silver plate approximately 6,000 sq. in.

The manufacturer states that the product has been laboratory and field tested and proven to be equal to any electroplating for bolted and stationary contacts.

NEWS

Travelgraph—A Correction

In an article appearing on page 262 of the May issue describing an adjusting arrangement developed in a railroad shop for application to an Oxweld shape-cutting machine, the cutting head was incorrectly referred to as a Travelgraph, a product of the Air Reduction Sales Company.

N. Y. R. R. Club Contest Winners

B. L. Savage, of the office of the executive vice-president of the Chesapeake & Ohio, Richmond, Va., has been awarded the first prize of $750 in the Roy V. Wright prize competition essay contest conducted by the New York Railroad Club. Mr. Savage's winning paper, Railroad Robbery, dealt with the problem of freight claims submitted against the nation's railroads.

A second prize of $500 went to B. Bernard Siems, of Industry, Pa., assistant supervisor of track on the Pennsylvania at Freedom, Pa., for a paper on the Importance of and Suggestions for Improving Man-Hour Productivity on Track Maintenance. The third prize, $250, was awarded to Raymond F. Ehler, of Boston, Mass., traffic representative on the New York, New Haven & Hartford, whose essay dealt with the Psychology of Attitude.

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE JUNE ISSUE

LOCOMOTIVE ORDERS

Road	*No. of locos.*	*Type of loco.*	*Builder*
Canadian National	18	600-hp. Diesel-elec. units	Canadian Gen. Elec. Co.
	20	1,000-hp. Diesel-elec. switching units	Montreal Loco. Wks.
Chesapeake & Ohio	140[1]	Diesel-elec. switching units	Electro-Motive and American Loco. Co.
Chicago, South Shore & South Bend	3[2]	5,530-hp. electric	General Electric Co.
Great Northern	5	1,500-hp. Diesel-elec. pass.	Electro-Motive
	3	3,000-hp. Diesel-elec. pass.	Electro-Motive
	5	6,000-hp. Diesel-elec. freight	Electro-Motive
	3	600-hp. Diesel-elec. switchers	Electro-Motive
	8	1,000-hp. Diesel-elec. switchers	Electro-Motive
	10	1,000-hp. Diesel-elec. switchers	American Loco. Co.
	2	1,500-hp. Diesel-elec. road switchers	American Loco. Co.

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Southern	200[3]	70-ton covered hopper	Pullman-Standard

[1] Eighty will be for the Chesapeake district and 60 for the Pere Marquette district. Walter J. Tuohy' president of the C. & O., points out that the Diesels being ordered for the Chesapeake district will displace coal-burning switchers that consume a total of 225,000 tons of coal a year. The C. & O. still buys 4,000 000 tons of coal each year for its locomotives. He further stated that it appears to the C. & O. that there are very substantial savings in the use of Diesels for switching purposes only. Their is no research going on at present in the use of coal-burning locomotives as competition for Daiels for switching. There is very active research on coal-burning gas turbines in progress. We are hopeful that the coal-burning turbine will take care of the competition with Diesels for road locomotive work, but there is no work being done on a competitive unit for switching."

[2] These locomotives were originally intended for shipment to Russia. The locomotives are of standard gage, are 88 ft. 10 in. long, and weigh 545,600 lb. Designed for line current at 3,300 volts, the railroad will rewire the units for the 1,500-volt South Shore power and put them into mainline freight service in several months.

[3] To cost approximately $1,200,000, Delivery expected during August.

NOTES:

The *New York Central* is completing the reconditioning of 100 standard coaches at a total cost of approximately $2,000,000. After this program 100 additional standard coaches will be similarly reconditioned in the road's shops at Beech Grove, Ind. All cars in the program are being equipped with electro-mechanical air-conditioning. Besides redecoration of the cars, brighter lighting is also being installed. Seats are being reupholstered and new flooring laid.

J. M. Hall Retires

John M. Hall, director of the Bureau of Locomotive Inspection of the Interstate Commerce Commission since August, 1935, retired from that position on May 31. He had completed more than 37 years of government service, all of which was with the bureau.

Mr. Hall was born May 20, 1879, in Kent county, Maryland, and attended public schools in Wilmington, Del. He also took a correspondence-school course in general mechanical engineering. His first employment was with a Wilmington newspaper for about four years, and then in a machine shop. In 1898, Mr. Hall enlisted in the Army and served as a private during the Spanish-American War. When he returned from that service, he entered the employ of the Pennsylvania in its signal department. Later he became, in turn, locomotive fireman and locomotive engineer on that road.

John M. Hall

Mr. Hall joined the staff of the Bureau of Locomotive Inspection on October 9, 1911, as district inspector with headquarters at Fort Worth, Tex. He continued in that capacity, although serving in other districts, until July, 1918, when he became assistant chief inspector of the bureau by appointment of the late President Wilson. As noted above, he became head of the bureau in August, 1935, when the late President Roosevelt appointed him to the position of chief inspector. The title was subsequently changed to director.

Mr. Hall is a member of the Brotherhood of Locomotive Firemen & Enginemen, American Society of Mechanical Engineers, Master Boiler Makers Association, Locomotive Maintenance Officers' Association, and Railway Fuel & Traveling Engineers' Association. He was guest of honor on June 2 at a testimonial dinner sponsored by his friends in the railroad and railroad supply industries. The dinner was held at the Emerson Hotel, Baltimore, Md.

SUPPLY TRADE NOTES

Black & Decker Mfg. Co.—*R. A. Lomas*, service engineer at the Seattle, Wash., branch of *Black & Decker*, has been transferred to the Los Angeles, Calif., branch as service engineer to supervise all service activities in Southern California on Black & Decker, Van Dorn, and Home-Utility Portable Electric Tools. *G. S. Ellis* has been appointed service engineer at Seattle to succeed Mr. Lomas.

◆

Wilson Engineering Corporation.—The Wilson Engineering Corporation, Chicago, has purchased the manufacturing and assembly plant facilities of *J. T. McGrath & Son*, Bloomington, Ill. *Robert W. Garvey* has been appointed vice-president and mechanical engineer and will direct operations of the newly acquired plant, with headquarters as before at Chicago.

◆

Oakite Products, Inc.—*John A. Carter* has been elected president of Oakite Products, Inc., to succeed *D. C. Ball*, who was elected chairman of the board. *David S. Ball*, formerly vice-president, has been elected to the newly created position of first vice-president.

◆

Globe Steel Tubes Company.—*F. K. Krell* has been appointed manager of sales, welding fittings, and *John F. Scott*, manager of sales, stainless and alloy tubing, of the Globe Steel Tubes Company. *John Koss*, formerly in charge of export sales, has been appointed sales representative, Chicago district, and *J. J. Lukens*, formerly head of the pricing division, has been appointed sales representative, New York district.

◆

Paxton-Mitchell Company; Paxton Diesel Engineering Company.—*Arthur H. Dutton*, Diesel inspector of the Union Pacific, has been appointed western representative for the Paxton-Mitchell Company and the Paxton Diesel Engineering Company, Omaha, Neb., succeeding the late James C. Peugh.

◆

D. J. Murray Manufacturing Company.—The D. J. Murray Manufacturing Company, Wausau, Wis., has appointed the following manufacturers' agents as distributors of grid unit heaters and allied products in their respective territories: *I. Ernest Shaer*, Boston, Mass.; *G. T. Pottinger & Co.*, Atlanta, Ga., the *Jordan Engineering Company*, Cincinnati, Ohio, and the *Lefler Wyomont Supply Company*, Casper, Wyo.

◆

Gould Storage Battery Corporation.—In commemoration of his 50 years continuous service with the Gould Storage Battery Corporation, *Almond H. Snyder*,

chief design engineer, was presented with a gold-inscribed wrist watch at a dinner and reception held in his honor at the Lancaster Country Club, Buffalo, N. Y., on May 3.

◆

CONTINENTAL SCREW COMPANY.—*Victor Ladetto* has been appointed sales manager of the Continental Screw Company, New Bedford, Mass., and *Donald H. Sleeper* has been appointed assistant sales manager.

Mr. Ladetto, who has been with Continental Screw for almost 25 years, has been assistant to *David D. Davis*, vice-president, for the past 10 years. Mr. Sleeper has been with the company for almost 14 years.

◆

WHITING CORPORATION.—George E. Miller, 24 Brighton avenue, Boston 34, Mass., and Grays Metal Works, Inc., Fifty-sixth street and Grays avenue, Philadelphia 43, Pa., have been appointed Whiting distributors in the Boston and Philadelphia territories, respectively. James J. Burke Company, 405 Kearns building, Salt Lake City 1, Utah, has been appointed a distributor in the Salt Lake City territory.

Harrison Taylor has been appointed a sales engineer of Whiting in the New York district office, 30 Church street, to succeed *A. R. Binckes*, who has been appointed district sales manager for the Pacific coast area, with headquarters at Los Angeles, Calif. Mr. Taylor, who will work under the direction of *D. Polderman, Jr.*, vice-president and export manager, in charge of the New York office, has been with Whiting since 1938, both as an engineer and estimator in the railroad products department, at Harvey.

◆

AMERICAN STEEL & WIRE CO.—The American Steel & Wire Co., a United States Steel Corporation subsidiary, has announced the formation of a separate mechanical spring sales division, to be known as the spring products sales division. *Charles W. Meyers*, formerly assistant manager of the metallurgical department, has been appointed manager of the new division, and *Robert D. Knight* has been appointed assistant manager.

◆

SHERWIN-WILLIAMS COMPANY. *Walter J. Boll*, formerly Pittsburgh, Pa., area representative for transportation sales of the Sherwin-Williams Company, has been appointed Gulf states zone representative for sales to the transportation and petroleum trade, to succeed the late *E. Langley Rumph*. Mr. Boll has been associated with Sherwin-Williams since 1924.

◆

JOHNS-MANVILLE CORPORATION. — The new research center of the Johns-Manville Corporation at Manville, N. J., was dedicated on May 24 by Governor Alfred E. Driscoll of New Jersey in ceremonies attended by several hundred scientists, engineers, builders, diplomats and journalists. The visitors inspected the four buildings of the research center, which is located on a 93-acre tract on the Raritan river, about 40 miles from New York, and saw research scientists at work on the more than 400 lines of Johns-Manville products. An illus-

trated news story on the research center was published in December, 1947. *Railway Mechanical Engineer*, page 727.

◆

B. C. AMES COMPANY.—The *G. C. Wood Company*, 717 Liberty avenue, Pittsburgh, Pa., has been appointed exclusive representative for the Ames line of micrometer dial indicators and gauges in the Tri-State area.

◆

MCKAY COMPANY.—The electrode sales department of the McKay Company have been moved to the company's executive offices in the McKay building, Pittsburgh, Pa. *Fred A. Kaufman*, electrode sales manager, and his entire staff, formerly at York, Pa., will maintain headquarters at 1005 Liberty avenue, Pittsburgh 22.

◆

WAUKESHA MOTOR COMPANY.—*Fred C. Schultze*, formerly assistant sales manager of the *Waukesha Motor Company*, Waukesha, Wis., has been appointed sales manager.

Fred C. Schultze

Mr. Schultze joined Waukesha in 1928 and was active in the various departments, including purchasing and plant engineering, before he joined the sales department.

◆

WESTINGHOUSE ELECTRIC CORPORATION.—*George M. Woods* has been appointed manager of the transportation section, industry engineering department, of the Westinghouse Electric Corporation to succeed *H. E. Dralle*, who has been transferred to the engineering and service department. Mr. Woods has been associated with the corporation since 1911.

◆

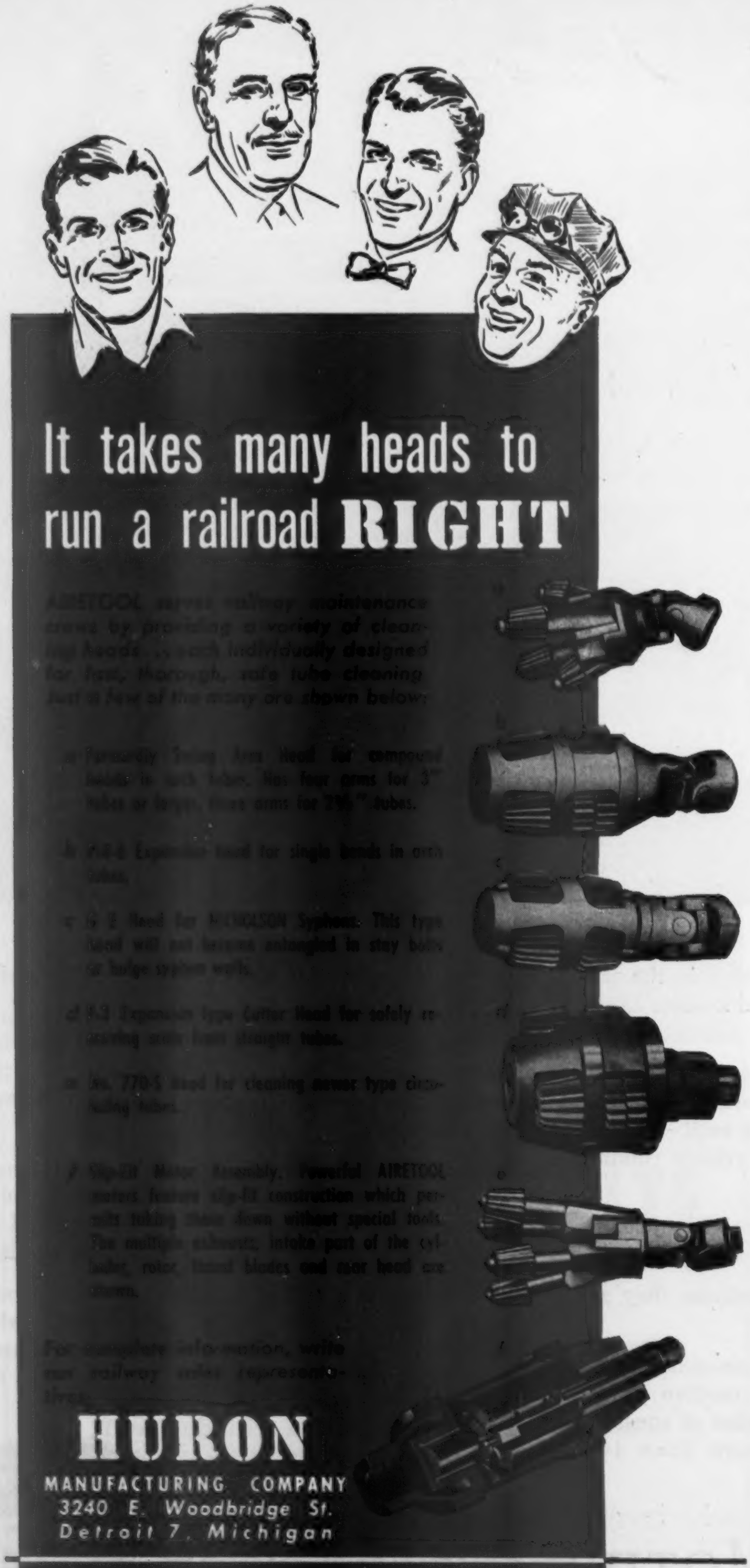
WESTINGHOUSE AIR BRAKE COMPANY.—*A. M. Wiggins*, formerly executive assistant to the president of the Westinghouse Air Brake Company, has been elected vice-president.

◆

AIR REDUCTION COMPANY.—The Air Reduction Company, New York, has opened a new oxygen plant at Flint, Mich., built at a cost of more than $250,000. In addition to the manufacture of oxygen, the new facility will be a supply point for acetylene gas and welding equipment and supplies.

◆

ALAN WOOD STEEL COMPANY.—The Alan Wood Steel Company, Conshohocken, Pa., has announced the following promo-



tions and transfers in its sales department: *J. Frederic Land*, appointed manager of sales, and *Leslie S. Bishop*, sales metallurgist; *H. E. Bossert* transferred from Philadelphia, Pa., district sales to New York district sales, and *John L. Hallman*, from general sales to Philadelphia district sales.

◆

SIMMONS-BOARDMAN PUBLISHING CORPORATION.—The Simmons-Boardman Publishing Corporation, publishers of *Railway Mechanical Engineer* and other railroad periodicals and books, has moved its Chicago office from 105 West Adams street to 79 West Monroe street, Chicago 3.

John R. Thompson, who joined the staff of the Simmons-Boardman Publishing Corporation as western district manager of advertising sales, transportation papers, at Chicago, in August, 1948, has been named vice-president, advertising sales, transportation papers, with headquarters remaining at Chicago. He has been appointed also business manager of Railway Engineering and Maintenance, succeeding, in that capacity, *S. Wayne Hickey*, a vice-president of the corporation in overall charge of advertising sales, Simmons-Boardman transportation publications, whose principal headquarters are now in New York. Pictures and sketches of Messrs. Thompson and Hickey appeared on page 598 of the October, 1948, *Railway Mechanical Engineer*.

◆

AMERICAN BRAKE SHOE COMPANY.—*Curtis C. Gary* has been appointed assistant to the president of the Brake Shoe and Castings Division of the American Brake Shoe Company, with headquarters at New York. Mr. Gary, who joined Brake Shoe in 1942, has been assistant to the vice-president in charge of division sales since 1947.

John F. Ducey, Jr., and *S. R. Watkins* have been appointed district sales mana-

John F. Ducey, Jr.

gers of the Brake Shoe and Castings Division, with headquarters at New York and Cleveland, Ohio, respectively.

Mr. Ducey joined Brake Shoe in 1936 as an apprentice, after graduation from Harvard University. During World War II he served as an officer in the United States Navy and was a commander at the time of his release.

Mr. Watkins began his association with

the Brake Shoe as an apprentice after he was graduated from Yale University in

S. R. Watkins

1939. He served with the United States Army during the war and was released from service with the rank of major.

◆

EQUIPMENT RESEARCH COMPANY.—*A. W. Faulconbridge*, vice-president of the Ajax-Consolidated Company, Chicago, has been appointed also vice-president of a new company known as the *Equipment Research Corporation*, which has been formed by Ajax-Consolidated to handle various items in the air conditioning and electrical fields. Equipment Research has been appointed exclusive sales agents for the recently redesigned railroad water coolers for coaches and Pullman cars, produced by *Cordley & Hayes Co.* of New York, and are agents also for the Cordley industrial electric water coolers for use in railroad shops, stations and offices.

◆

INDEPENDENT PNEUMATIC TOOL COMPANY.—The Independent Pneumatic Tool Company has constructed new factory branch sales and service buildings at 1405 West Washington boulevard, Chicago; 32-34 Greenpoint avenue, New York; 204 Thomas street, Pittsburgh, Pa.; and 1909 Davenport road, Toronto, Ont. The buildings replace previous office sites in the same cities.

◆

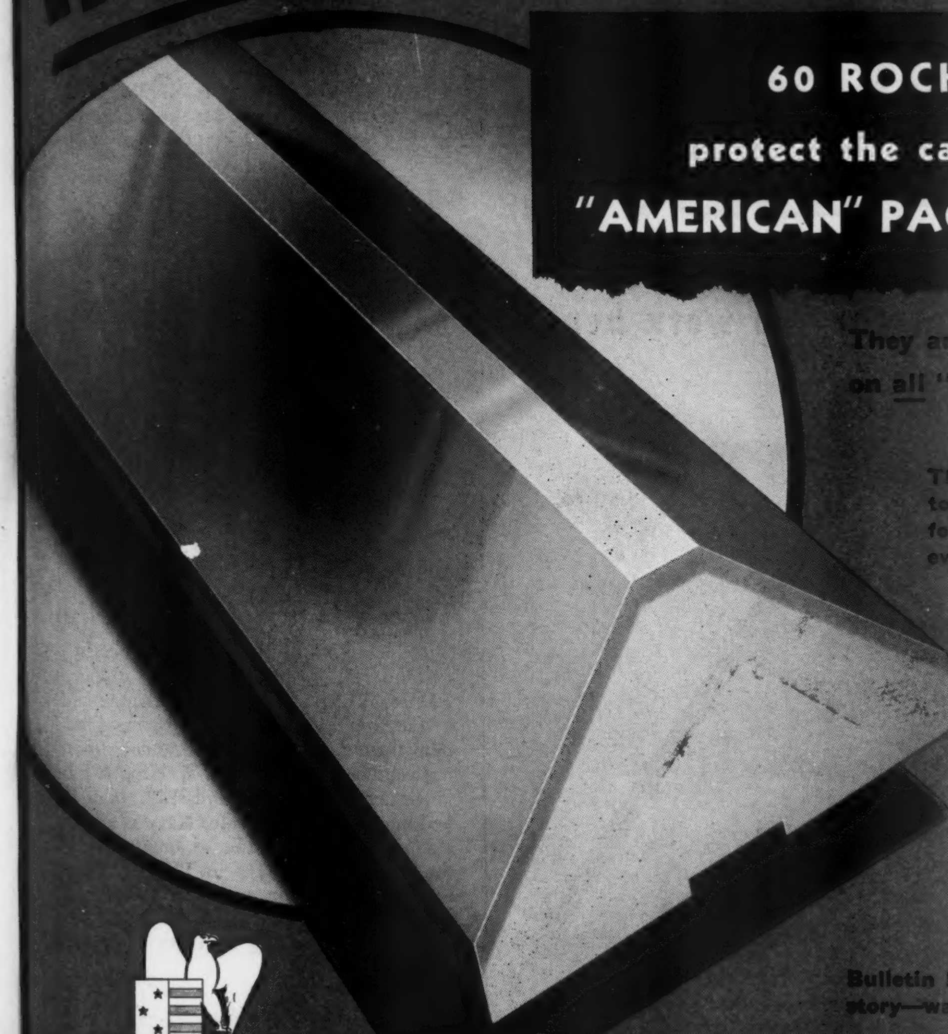
INTERNATIONAL STEEL COMPANY.—The International Steel Company, Evansville, Ind., announces the formation of a railway division to to manufacture and market railway products, including freight-car sides, underframes, box-car doors, brine tanks, stainless-steel floors, racks and bracing panels for refrigerator cars. In addition to these and other rolling-stock parts now being developed, the company will furnish sectional buildings, for use as oil storage depots, shop and service buildings, which, it is said, may be dismantled and relocated with 100 per cent salvage of original material. All fabricating will be done in the company's 11-acre plant at Evansville, where 500,000 sq. ft. of floor space is devoted to machinery and production-line methods. In charge of the railway division will be Walter G. Koch, senior vice-president, and Wesley D. Hamilton, vice-president, reporting to President Henry Bohnsach. The railway division has recently

Hardened Tool Steel Vees

60 ROCKWELL C

protect the carriage ways of

"AMERICAN" PACEMAKER LATHES



They are standard equipment on all "AMERICAN" Lathes

These hardened vees are made of solid tool steel and ground to gauge tolerances for interchangeability should replacement ever be required.

After hardening, the metallurgical structure is stabilized by cold treatment at minus 108° Fahrenheit to prevent twisting or warping.

This feature is but one of the outstanding advantages offered by the new "AMERICAN" Pacemaker Lathe.

Bulletin No. 16 gives the complete story—want one?

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

LATHES AND RADIAL DRILLS

retained as consultant *K. F. Nystrom*, retired chief mechanical officer of the Chicago, Milwaukee, St. Paul & Pacific.

◆

BALDWIN LOCOMOTIVE WORKS.—*Richard D. Durrett* has been appointed sales manager—Diesel locomotive sales of the Baldwin Locomotive Works.

Mr. Durrett is a marine engineer graduate of the New York State Merchant Marine Academy. He was assistant engineer of the Cleveland Cliffs Iron Company from

Richard D. Durrett

1938 to 1940; installation superintendent of the Iron Firemen Manufacturing Company during 1940 and 1941; and coordinating engineer for the Lewis Welding & Engineering Corp. in 1941 and 1942. In 1942 he joined the United States Navy as an ensign and held the rank of lieutenant at the time of his discharge in 1945. Mr. Durrett joined Baldwin on April 3, 1946, as sales engineer, and on February 1, 1948, was appointed acting manager of Diesel product sales.

◆

GENERAL ELECTRIC COMPANY.—The following appointments have been made in the locomotive and car equipment divisions of the General Electric Company: *H. O. Trumpheller*, formerly assistant to the manager of manufacturing, has been appointed manager of manufacturing; *David Blair*, formerly production manager, has been appointed assistant to the manager in charge of procedures; and *C. E. Shank*, formerly assistant production manager, has become production manager. *Harold E. Strang*, engineering manager of the affiliated manufacturing companies department, has been appointed manager of the G.E. apparatus department's meter and instrument divisions at Lynn, Mass., to succeed *Nicholas M. DuChemin*, who has been appointed an assistant general manager of the apparatus department, as has *John W. Belanger*, manager of the turbine divisions at Schenectady, N. Y. Messrs. Belanger and DuChemin will assist in directing operations of the department's product divisions, works service divisions, and various works.

F. C. Neal, Jr., who has been associated with the General Electric Company since 1936, has been appointed manager of the distributor sales division of the company's welding divisions. Mr. Neal will

make his new headquarters at Fitchburg, Mass., and will be succeeded as manager of the Houston, Tex., welding division by *Preston D. Morgan.*

T. F. Perkinson, assistant manager of the transportation engineering division of the apparatus department of the General Electric Company, has been appointed manager of the division, to succeed *C. M. Davis,* who has retired after nearly 40 years' service with the company.

Mr. Perkinson is a graduate of Rensselaer Polytechnic Institute (1924). After graduation he joined G. E. as an electrical engineer at Schenectady, N. Y., and, a year later, transferred to Erie, Pa., headquarters of the locomotive and car equipment divisions. In 1945 he was appointed manager of the railroad rolling stock division and in 1946 assistant manager of the transportation engineering division.

T. F. Perkinson

◆

W. M. GIBBS RAILWAY SUPPLY COMPANY.—*Walter M. Gibbs,* executive vice-president of the Spring Packing Corporation, Chicago, has resigned from that firm and formed his own railway supply business, the W. M. Gibbs Railway Supply Company, 332 South Michigan avenue, Chicago.

Mr. Gibbs had been associated with Spring Packing since 1925, when he was employed as sales and service engineer. He then became a sales representative, and in 1930 was elected secretary and a director. In 1932 he was elected also vice-president, on January 1, 1947, when he became executive vice-president.

◆

BUDD COMPANY.—The Budd Company has acquired title to the Red Lion plant at Philadelphia, Pa., where it will continue the building of railway passenger cars.

◆

GISHOLT MACHINE COMPANY.—The Detroit branch office of the Gisholt Machine Company has been removed to 15484 James Couzens Highway, Detroit 21, Mich.

◆

GUSTIN-BACON MANUFACTURING COMPANY.—*Dr. Carl M. Marberg,* for the past two years co-ordinator of research planning for the Standard Oil Company of Indiana, has joined the research staff of the Gustin-Bacon Manufacturing Company at Kansas City, Mo.

The Gustin-Bacon Company has estab-

lished a pilot plant at Kansas City in connection with its fibrous-glass products development. *Marion W. Phillips*, formerly of the Midwest Research Institute, is supervisor of the laboratory.

Dr. George W. Ward has been appointed director of research, product development, and laboratory.

◆

AMERICAN HOIST & DERRICK CO.—*John E. Carroll* has been appointed general sales manager of the American Hoist & Derrick Company, St. Paul, Minn.

◆

CHICAGO PACKING CORPORATION.—The Chicago Packing Corporation, Chicago, moved, on June 1, to new quarters at 332 South Michigan avenue in that city.

Obituary

JAMES S. HEARONS, sales manager, railway division, of the Clark Equipment Company at Chicago, died on June 12.

◆

WILLIAM H. CROFT, SR., former president and board chairman of Magnus Metal Corporation, Chicago, died at Los Angeles, Calif., on May 13, at the age of 71.

◆

JAMES C. PEUGH, western representative of the Paxton-Mitchell Company, died on May 27, at Omaha, Neb.

◆

JOHN H. JASCHKA, formerly district sales manager at St. Louis, Mo., for the National Malleable & Steel Castings Co., died on May 22, at his home in Clayton, Mo. Mr. Jaschka joined the company at Indianapolis, Ind., in 1901, and shortly afterward transferred to the engineering department in Cleveland, Ohio. In 1904 he opened the company's San Francisco, Calif., sales office and in 1919 was again transferred to Cleveland on special duty. He was appointed district sales manager at St. Louis in 1931, from which position he retired in May, 1948.

◆

RICHARD SHERIDAN, recently retired president of the John B. Astell Company, died on May 22, at the Johns Hopkins Hospital, Baltimore, Md. Mr. Sheridan had been employed, successively, on the Boston & Maine, the New York, New Haven & Hartford, and as eastern sales representative of the Chicago Railway Equipment Company.

PERSONAL MENTION

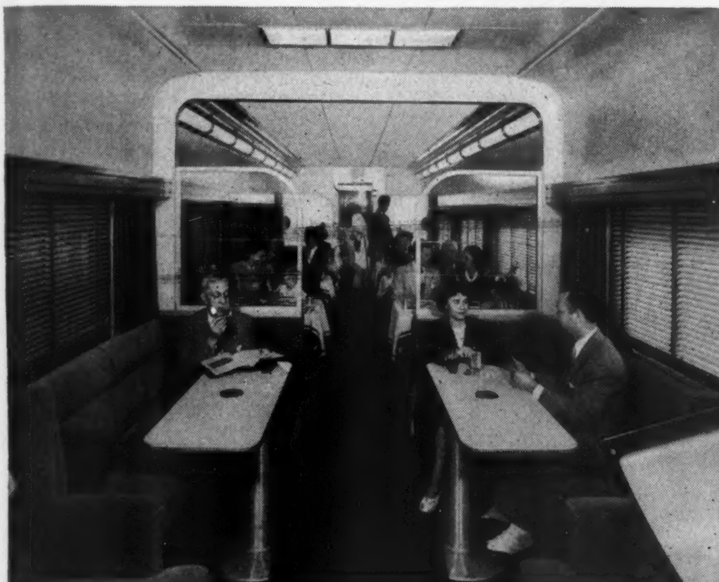
General

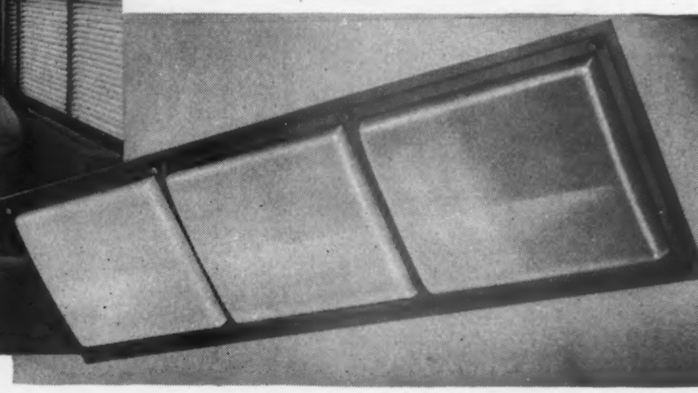
E. M. VANDIVER has been appointed acting master mechanic of the Omaha-Northern Kansas and Kansas City Terminal division of the Missouri Pacific with headquarters at Falls City, Neb.

F. V. STONE, assistant to the manager of the department of research of the Canadian Pacific at Montreal, Que., has been appointed assistant manager of the re-

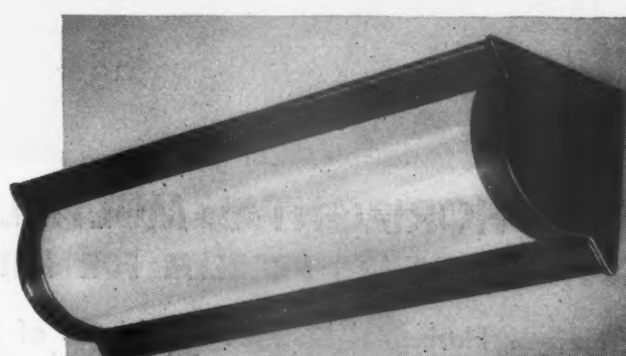
FLUORESCENT LIGHTING with GLASS or PLASTIC Shades

by SAFETY COMPANY





This diner-lounge car has Slimline fluorescent ceiling fixture, shown in close-up at right. The fixture, used with glass or plastic shade, is recommended for bedrooms, compartments, and drawing rooms, and for general lighting in lounges, diners, chair cars and coaches. Slimline lamps have desirable features not available in standard fluorescent lamps. Choice of eight output values.



Illustrated above is fluorescent cove light, designed to fit neatly into corner of ceiling and sidewall.

Fluorescent lighting fixtures by Safety Company are available in a wide range of styles, in practical and modern types, with either glass or plastic shades.

Safety Company car lighting fixtures are designed for the specific requirements of railway operation. Each type is optically correct and sound in mechanical and electrical construction to withstand the severe conditions encountered in railroad service.

Advantages of this equipment include efficiency in light output, refinement in design, ease of application, minimum penetration or projection, and simplified maintenance.

Whether your car lighting problems are solved through the variety of Safety Company standard lighting fixtures, or by the adaptation of these designs to individual requirements, you benefit from the specialized experience of our lighting engineers and designers.

Descriptive data sent promptly on request.

THE SAFETY CAR HEATING AND LIGHTING COMPANY INC

NEW YORK CHICAGO PHILADELPHIA ST. LOUIS SAN FRANCISCO NEW HAVEN MONTREAL

SAFETY COMPANY PRODUCTS INCLUDE: Complete Air-Conditioning Equipment • Fans • Genemotors • Generators Motor Alternators • Regulators • Lighting Fixtures • Switchboards • Parcel Racks • Generator Drives.

search department. Mr. Stone received the degree of M.A. at McGill University in 1933. He joined the Canadian Pacific in 1938 and has been with the department of research since 1945. He became assistant to the manager of the research department in 1947.

T. J. CONWAY, road foreman of engines of the Texas & Pacific at Big Spring, Tex., has been appointed fuel supervisor at Dallas, Tex.

H. B. BOWEN, chief of motive power and rolling stock of the Canadian Pacific at Montreal, Que., has retired. Mr. Bowen was born in Derbyshire, England, on May 17, 1884, and was educated in railway machine work at the Manchester School of Technology. He entered the service of the Canadian Pacific in 1905 in the Angus shops at Montreal, and the following year he went to Winnipeg, Man., where he served successively as draftsman, foreman wheel and tender shop, shop engineer, chief draftsman, works manager, and assistant superintendent motive power of the Western lines. In August, 1928, Mr. Bowen returned to Montreal as chief of motive power and rolling stock. Mr. Bowen is a member of the General Committee, Mechanical Division, Association of American Railroads; the Institution of Locomotive Engineers, and the Canadian Railway Club.

H. B. Bowen

W. A. NEWMAN, manager of the department of research of the Canadian Pacific at Montreal, Que., has been appointed chief of motive power and rolling stock, with headquarters at Montreal. Mr. Newman was born on June 29, 1889, at Hamilton, Ont., and was educated at Queen's University, Kingston, Ont., where he received the degree of B.Sc. in 1911. After graduation he joined the Canadian Pacific as special apprentice and during 1914 and 1915 he was assistant professor of mechanical engineering at Queen's University. From 1916 to 1940 Mr. Newman served, successively, as engineer of locomotive and car construction; mechanical engineer, and chief mechanical engineer of the Canadian Pacific at Montreal. From 1940 to 1945, he was on leave with the government of the Dominion of Canada as president and general manager of the Federal Aircraft Ltd., and as aircraft control-


HOLLOW
Flexible
STAYBOLTS
LT. WT. 66000
Provide —
Greater Safety
Maximum Economy
Increased Availability
Faster Inspections
Higher Mileage
FLANNERY BOLT COMPANY
BRIDGEVILLE ★ PENNSYLVANIA

ler and aviation administrator for the Wartime Prices and Trade Board. He has been manager of the Canadian Pacific's department of research since its formation in 1945.

W. A. Newman

Master Mechanics And Road Foremen

O. T. Butcher, shop superintendent of the Pere Marquette district of the Chesapeake & Ohio at St. Thomas, Ont., has been appointed master mechanic of the Canadian division, with headquarters at St. Thomas. Mr. Butcher began his service with the C. & O. in 1911 as a machinist apprentice at St. Thomas, Ont., and was promoted successively, to gang leader, erecting foreman, and shop superintendent (in 1941).

Richard Kling, master mechanic of the Omaha-Northern Kansas and Kansas City Terminal divisions of the Missouri Pacific at Falls City, Neb., has been granted a sick leave.

Earl Fisher, assistant master mechanic of the Denver & Rio Grande Western at Denver, Colo., has been appointed master mechanic of the Pueblo division with headquarters at Burnham, Colo.

Charles R. Eisele, shop engineer of the Denver & Rio Grande Western system, has been appointed master mechanic of the Grand Junction division.

H. F. Mackey, who has been appointed master mechanic of the Atchison, Topeka & Santa Fe at Clovis, N. M., as announced in the April issue, was born on August 31, 1905, at Topeka, Kan. He entered the service of the Santa Fe as a telegraph operator at Topeka. He resigned on February 22, 1926, but returned to Topeka on July 19, 1926, as a machinist apprentice. He completed his apprenticeship on July 14, 1930, and remained at Topeka, serving, successively, as laborer, stationary fireman, car-

man helper, machinist helper, and machinist until September, 1939, when he was transferred to Chicago as a Diesel maintainer. He was appointed assistant supervisor of Diesel engines at San Bernardino, Calif., on March 1, 1944; supervisor of

H. F. Mackey

Diesel engines at Chicago on March 1, 1947, and on February 15, 1949, master mechanic at Clovis.

RALPH M. MCCLEAN, master mechanic of the Pueblo division of the Denver & Rio Grande Western at Burnham, Colo., has been appointed general master mechanic in charge of steam locomotive maintenance and servicing for the entire system.

W. R. WITHERSPOON, master mechanic of the Atlantic Coast Line at High Springs, Fla., has been appointed master mechanic at Waycross, Ga.

R. L. PENTON, general foreman of the Atlantic Coast Line at Jacksonville, Fla., has been appointed master mechanic, with headquarters at Rocky Mount, N. C.

ERNEST WOODRUFF, master mechanic of the Canadian division of the Chesapeake & Ohio, Pere Marquette district, retired on June 1. Mr. Woodruff was born on May 23, 1884, at Queenston, Ont. He entered the service of the C. & O. as a pattern maker at St. Thomas, Ont., in 1908, and served thereafter as mill foreman and general foreman until 1941 when he became master mechanic of the Canadian division.

Electrical

R. HUMBLE, assistant foreman of the Canadian National at Point St. Charles, Ont., has been appointed electrical supervisor, with jurisdiction over the Montreal Terminals, Mount Royal and L'Assumption subdivisions electrified zones and with headquarters at Montreal, Que.

Car Department

J. GRAHAM, car foreman of the Canadian National at Stratford, Ont., has been appointed car foreman at London, Ont.

G. N. HYDE has been appointed production supervisor at the Beech Grove, Ind., shops of the New York Central.

S. E. HARVEY, assistant car foreman, coach yard, of the Canadian National at Toronto, Ont., has been appointed car foreman at Stratford, Ont.

A. D. AKERS has been appointed production supervisor at the Beech Grove, Ind., shops of the New York Central.

Shop and Enginehouse

E. L. SPICER, master mechanic of the Atlantic Coast Line at Waycross, Ga., has been appointed shop superintendent at Waycross.

L. H. COOPER, master mechanic of the Atlantic Coast Line at Rocky Mount, N. C., has been appointed shop superintendent at Rocky Mount.

HARRISON L. PRICE, who has been appointed superintendent of shops of the Atchison, Topeka & Santa Fe at Albuquerque, N. M., as noted in the April issue, was born on November 27, 1898, at Kearney, Neb. He attended high school at Topeka, Kans., and on February 7, 1916, became a machinist apprentice in the employ of the Santa Fe at Topeka, Kans. He subsequently served as a machinist, inspector, welder, and apprentice instructor at Shopton, Iowa, and as test department assistant at Topeka, until October, 1936, when he became enginehouse foreman at Chillicothe, Ill. He

H. L. Price

was appointed air-brake foreman at Chicago coach yard on January 1, 1938. From September, 1941, until February 1, 1943, he was car gang foreman, acting superintendent of shops, and shop superintendent at Chicago car works. On the latter date he was appointed master mechanic of the Southern Kansas Division, with headquarters at Chanute, Kans., and on May 1, 1943, was transferred to the position of master mechanic of the Illinois Division and the Chicago Terminal Division. On February 15 of the current year he became superintendent of shops at Albuquerque.